April, 1956

Vol. 45
No. 4

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

The Drawing Instruments Engineers Use and Recommend

Every year thousands of young men reach the point in their schooling where the purchase of a set of drawing instruments is required. When such young men are the sons of technically trained fathers, or when they have the benefit of guidance by any elders in engineering, it is almost certain they will insist on genuine Dietzgen Drawing Instruments. Dietzgen are the drawing instruments engineers use and recommend.

Knowing what to buy and insisting on the genuine is a matter of unusual importance in buying drawing instruments. First, drawing instruments are normally purchased but once in a lifetime. They thus become either a source of pride and satisfaction for many years . . . or a matter of unending annoyance and regret. But of even greater consequence is the fact that fine drawing instruments afford the unique opportunity to inspire men to achievement. The precision and craftsmanship in Dietzgen Drawing Instruments are both a challenge to ambition and an example of the essentials for success in engineering. This inspiration frequently proves to be the foundation for a brilliantly successful career.

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Many so-called "bargain" sets of drawing instruments are orphans; their manufacturer is either out of business or not responsible for repairs or replacements. Dietzgen Drawing Instruments are protected by a Lifetime Service Policy which is enclosed with each set. This Dietzgen Policy stipulates that the instrument designs are standardized so lost or damaged parts can be replaced with perfectly fitting parts made from the same tools and with the same skill as the original parts. Further, the Dietzgen Lifetime Service Policy stipulates that adequate stocks of such parts will be maintained for the entire lifetime of any purchaser of a set of Dietzgen Drawing Instruments.

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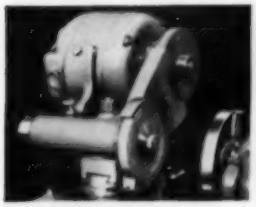
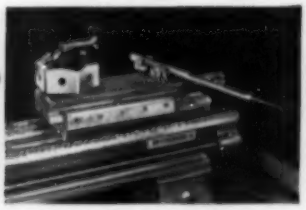

External Grinder

Milling Attachment

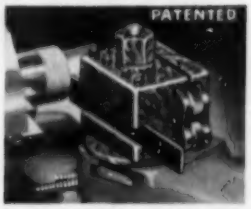
Handlever Tailstock


Handlever Bed Turret

Telescopic Taper Attachment

Handwheel Collet Attachment

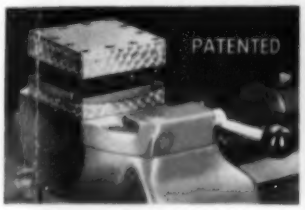
Handlever Collet Attachment



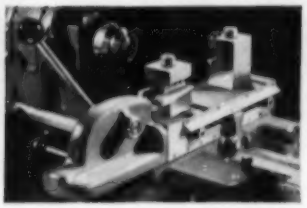
10 in 1 Tool Holder

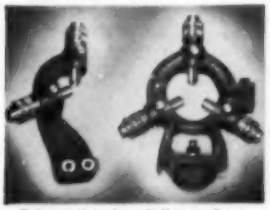
Ball Bearing Live Center

Adjustable Collet Bushing Chuck



Square Turret Tool Block


Handlever Double Tool Cross Slide


Telescoping Jaw Follower Rest and Center Rest

Collet Rack

Steel and Brass Collets

SOUTH BEND

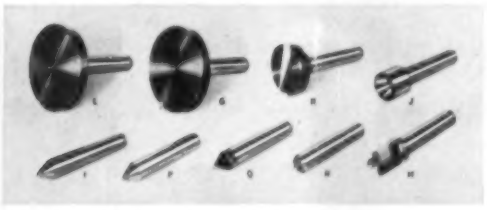
LATHE ATTACHMENTS

— Cut Production Time
— Simplify Difficult Jobs
— Increase Lathe Versatility
— Speed Up Tooling
— Perform Special Classes of Work
— Reduce Operator Fatigue

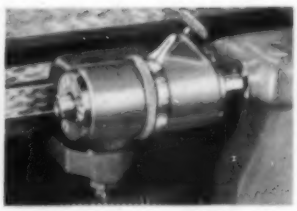
WRITE FOR CATALOG 5600

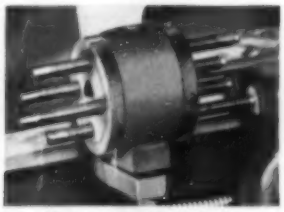
SOUTH BEND LATHE
SOUTH BEND 22,
INDIANA

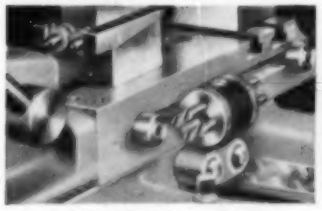
Step Chucks and Closers


Centers and Drill Pads

Thread Indicator


Micrometer Carriage Stop


Four Position Carriage Stop


Four Position Cross Slide Stop

Dial Indicator Carriage Stop

Coolant Pump

Universal Table

Have You Heard the Latest • • •

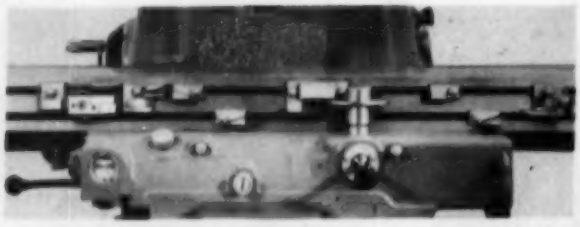
about the finest general purpose milling machines?

CINCINNATI

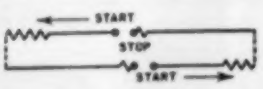
There are many reasons why new CINCINNATI MI and ML Milling Machines are naturals for school shops. Here are a few: These machines always were considered the finest toolroom equipment for industry. Now they are better than ever before . . . less maintenance, easy to operate, extremely versatile; they give your students an opportunity to become familiar with a wide variety of milling setups. ¶ Three features of value in teaching students how to obtain low production costs are shown below. Of course, there are many more features, all of which are outlined in a new CINCINNATI No. 2ML and 2MI catalog No. 1916. Copies will be sent to school shop instructors on request.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

A crank-type control at front of knee, makes selection of feeds quick and easy.



Automatic reciprocal milling setups, with center safety stop, may be assigned to Automatic Cycle Machines. That's because automatic backlash eliminator is a standard feature



Enclosed electrical controls. Individual motor for feed drive.

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APRIL
1956

VOL. 45 NO. 4

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

Published on the 15th of the month preceding the date of issue by THE BRUCE PUBLISHING CO., 400 North Broadway Milwaukee 1, Wis. • CENTRAL OFFICE: 20 North Wacker Drive, Chicago 6, Ill. • EASTERN OFFICE: 225 Broadway, New York 7, N. Y.

★ ★ ★

This Month's Cover

The boys depicted in this month's cover picture are Daniel Casey showing the correct use of the drill press, Eugene Giddings demonstrating the use of the band saw, and Warren Page using the jointer. The boys are students at South High School, Worcester, Mass.

The photograph was made by Tad Arnold, student in the industrial-arts classes, and sent to us by Ralph C. Mayo, instructor.

Buy Easter Seals

The 1956 Easter Seal campaign opened Saturday, March 10, and will continue through Saturday, April 10.

★ ★ ★

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Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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Association News

COMING CONVENTIONS

Mar. 22–24. Ohio Industrial Arts Association, at Neil House, Columbus, Ohio. Secretary, C. R. Hawes, 629 Switzer St., Greenville, Ohio.

Mar. 25–29. American Personnel and Guidance Association, at Shoreham Hotel, Washington, D. C. Secretary, Dr. Arthur A. Hitchcock, 1534 "O" St. N.W., Washington, D. C.

Apr. 6–7. Washington Industrial Arts Association, at John Rogers High School, Spokane, Wash. Secretary, Gilbert Brooks, 1525 W. 8, Spokane 43, Wash.

Apr. 11–12. New York State Steering Committee for Industrial Arts, at New Yorker Hotel, New York, N. Y. Secretary, Richard S. Enders, Cold Spring Road, Baldwinsville, N. Y.

Apr. 12–14. Michigan Industrial Education Society, at Sheraton-Cadillac Hotel, Detroit, Mich. Secretary, Eugene Watkins, 4029 Allen Court, Bay City, Mich.

Apr. 13. Industrial Education Conference, at Memorial Union, Ames, Iowa. President, Lowell L. Carver, 101 Industrial Arts Building, Iowa State College, Ames, Iowa.

Apr. 13–14. West Virginia Industrial Arts Association, at Jackson's Mill, W. Va. Secretary, E. Dickson Willis, 2702 S. Staunton Road, Huntington, W. Va.

Apr. 20–21. Connecticut Industrial Arts Association, at Teachers College of Connecticut, New Britain, Conn. Secretary, Carl H. Hubachek, High School, Branford, Conn.

Apr. 21. Utah Industrial Arts Association, at Wasatch School, Provo, Utah. Secretary, Jay L. Nielson, Farrer Junior High School, Provo, Utah.

Apr. 24–27. American Industrial Arts Association, at Hotel Schroeder, Milwaukee, Wis. Secretary, Dr. Kenneth W. Brown, Box 2350, Buffalo 23, N. Y. Local chairman, Roy A. Radtke, 1111 North Tenth St., Milwaukee, Wis.

May 4–5. Wisconsin Association for Vocational and Adult Education, at Loraine Hotel, Madison, Wis. Secretary, C. D. Rejahl, 211 N. Carroll St., Madison, Wis.

May 12. Virginia Council of Industrial Education Clubs, at Hotel Roanoke, Roanoke, Va. Secretary, O. F. Haynes, High School, Petersburg, Va.

AMERICAN INDUSTRIAL ARTS ASSOCIATION CONVENTION

Thought-provoking convention sessions with the best in industrial arts on hand, a great many new exhibits, educational trips through Milwaukee schools and industries — plus entertainment for conventioneers and their wives — all these are scheduled and promised for the 18th Annual Convention of The American Industrial Arts Association at Milwaukee, April 24 to 27.

Leaders in industrial arts from all over the United States will be a part of the convention program which has been prepared by Roy A. Radtke, director of industrial arts of the Milwaukee public schools, and vice-president of the Association.

Preceding and simultaneous with the sessions of the Association will be the seventh annual convention of the American Council of Industrial Arts Teacher Education with meetings on Tuesday and Wednesday, April 24 and 25; and the sixth annual convention of the American Council of Industrial Arts Supervisors are on the same days. Meeting during the same convention will be the executive secretaries of state organizations.

Official opening of the chief convention will be on Wednesday at 1:30 p.m., in Kilbourn Hall of the Milwaukee Auditorium with Burl N. Osburn, president of the AIAA, and head of the industrial-arts department at Millersville State Teachers College, Millersville, Pa., presiding. Roy A. Radtke will introduce the 1956 program of the association.

Pointing up the convention theme, "Improving Industrial Arts Through Evaluation," will be the general sessions and the discussion groups. Among the chief topics are: "What Do We Believe and Why About Industrial Arts Education?," "What We Teach: the Recurring Challenge of Content and Emphasis," "How Do We Teach?," "How Do We House These Programs?," and the final general session of Friday morning summing up the general theme.

Chairman and speakers for the convention include leaders in industrial arts from many parts of the country, including: John A. Fuzak, William J. Micheels, John Jarvis, John Whitesel, Stanley Pawelek, G. Wesley Ketcham, R. Lee Hornbake, Kermit Seefeld, Victor Bowers, Ralph Wenrich, M. Ray Karnes, and Kenneth Perry.

(Continued on page 6A)

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LOOK IN THE YELLOW PAGES UNDER "TOOLS-ELECTRIC"

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PORTABLE ELECTRIC TOOLS

ASSOCIATION NEWS

(Continued from page 4A)

On Thursday evening the convention will meet in a general session as guests of the Allen-Bradley Company for dinner and entertainment. Friday evening's program includes the annual banquet of the AIAA in the Schroeder Hotel with Dr. Harold S. Vincent, superintendent of Milwaukee Public Schools, as principal speaker. The Ship will hold its party immediately after the banquet.

Among the many unique exhibits scheduled for the AIAA are the outstanding "Civilization Through Tools" exhibit presented by the DoAll Corporation; prize-winning projects in the Ford Industrial Arts Awards program; master craftsmanship projects of industrial-arts teachers, an exhibit of well-designed pieces of furniture, industrial-arts work from Milwaukee and suburban schools, plus the excellent commercial exhibits featuring the newest and best in equipment, tools, and materials.

A special program for ladies has been arranged by Mrs. Roy A. Radtke with the South Room of the Schroeder Hotel being set aside for them as a meeting and recreation room.

EIGHTEENTH ANNUAL INDUSTRIAL-ARTS CONFERENCE AT OSWEGO

Plans for the Eighteenth Annual Industrial Arts Spring Conference for industrial-arts teachers, supervisors, and administrators, at the State University Teachers College, Oswego, N. Y., on Thursday and Friday, May 10 and 11, 1956, are reaching their final stages.

On Thursday morning, May 10, at the general session in the college auditorium, the General Motors Company will present its outstanding demonstration, "Previews of Progress."

After a noon luncheon in the College Union, the program will consist of demonstrations and exhibits in the various industrial-arts laboratories of the college. Supplementing these exhibits will be the many exhibits of commercial products in the industrial arts and vocational education fields.

Thursday evening the annual banquet sponsored by Epsilon Pi Tau at Oswego's Hotel Pontiac, will feature an address by Dr. Philip Lovejoy, educator, executive, and international speaker of rare ability. He will speak on the subject, "Public School Relations for Administrators and Teachers."

The Friday morning general session will feature an address on "Industrial Arts in the Elementary School," by Dr. Florence Stratemeyer of Teachers College, Columbia University.

The Friday afternoon sessions will be devoted to additional displays, demonstrations, and exhibits in the industrial-arts shops and laboratories.

The finale of the two-day industrial-arts festival, will be an open house Friday evening in all of the industrial-arts laboratories for the people of the city of Oswego and surrounding community.

OKLAHOMA INDUSTRIAL ARTS ASSOCIATION MEETING

The annual meeting of the Oklahoma Industrial Arts Association convened in Oklahoma City, October 27 and 28, 1955. The first session was the nineteenth annual meeting of the State Advisory Committee for Industrial Arts in Oklahoma Schools. It was in session all day Thursday. This committee has been enlarged to include the chairmen of the eight Oklahoma Education Association district sections of industrial arts. Dr. DeWitt Hunt served as consultant for this all day meeting.

The annual banquet was held Thursday evening. Dr. Hunt, specialist for industrial arts in the U. S. Office of Education, Washington, D. C., presented the address of the evening. He spoke on "The Position of Specialist for Industrial Arts in the United States Office of Education."

Following the address, Hugh Norris presented life memberships in O.I.A.A. to Dr. Hunt and Herman F. Rusch, honoring their many years of service to industrial arts in Oklahoma.

Officers elected for 1956 are: Robert K. Phelps, president; Denton Floyd, vice-president; C. L. Hill, secretary-treasurer.

During the day, Friday, October 28, there were eight sectional meetings for the teachers in leathercraft, woodwork, printing, photography, plastics, general metal, printing, and electricity. These meetings were followed by a general meeting at which Dr. Hunt presented a paper entitled "Industrial Arts in the United States in 1955." At the close of his part of the program, he was presented with a "Book of Letters" containing congratulatory messages from his many friends.

All day Friday the commercial exhibitors presented the largest show of shop equipment and supplies in the history of the annual meetings. They closed their exhibit with a "Ship" program which was well received.

The attendance at these several meetings totaled approximately 550 people.

CAREERS UNLIMITED

Careers Unlimited is the name applied to an exhibition aimed to acquaint our school

(Continued on page 16A)

An unbeatable value for school shop use

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One-piece cast iron bed and back: all other parts are steel and all exposed parts are nickel-plated. The extendable swinging lever travels freely from 45° to 90°, right or left, and locks automatically at frequently used angles.

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NEW working features that make your teaching more effective . . . . . .

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20" PLANER

Students advance quickly on Parks Planers because they find them easy to operate, safe, and accurate. And, since both the Parks 12" and Parks 20" Planers have been designed and precision-built for accuracy and high-speed line production in industry, they are ideally suited for the school shop because they give practical experience on the type of machines your students will eventually use. Both machines are priced low enough for even the most modest shop budget.

The Parks No. 20. 20" Planer has a 4-knife cutterhead with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M., and 40 and 80 F. P. M. Will take work up to 20" wide by 6" thick. Ruggedly built for vibrationless operation.

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- Plane blades, chisels
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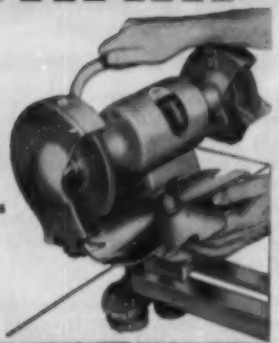

You'll wonder how you ever got along without it, once you have the new Foley 314 Grinder in your shop. This versatile, high quality, low cost grinder does a beautiful job on all types of circular saws and dado heads—also has handy attachments for practically all sharp edged tools. It's a marvel for operating ease and speed, capacity and precision work—compares favorably with grinders costing two to three times as much. Meets safety standards. Fully guaranteed for one year. Write today for full information and prices on Foley 314 Grinder and attachments.

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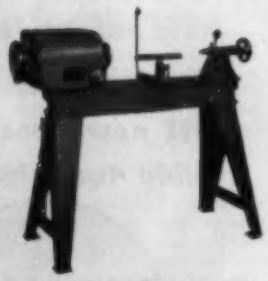

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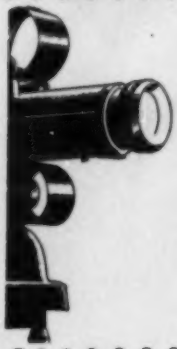

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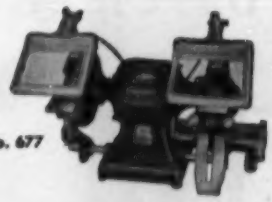

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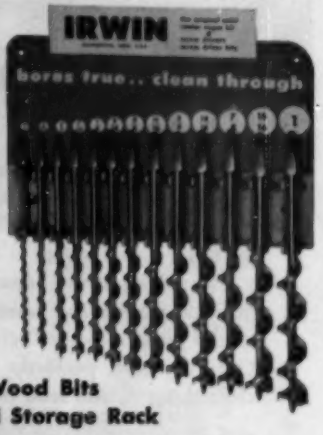

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HOW-TO project for the School Shop

—by NICHOLSON FILE COMPANY

NO. 17 OF A SERIES

MAKING KEY SEAT CLAMPS

Photographs at left are approximately 1½ times actual size.

The following project is an exercise in matching two pieces of work by filing both the angles and the radii, and also shows that files will give a clean, satin-smooth finish on skilled instrument work.

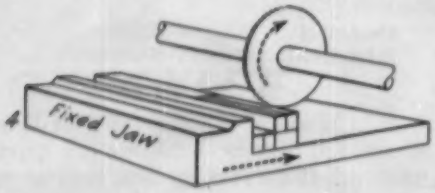
Stock: 2 pieces 7/16" square CRS 1 3/16" long; 1 piece 1/2" round CRS 2 1/2" long. **Tools:** 6" rule, square, layout dope, center head, scriber, center punch, hammer, #29 drill (.136), 8-32 machine screw tap, tap wrench, 3/32"-wide metal slitting saw, dividers, 1" micrometer, 8" Mill Bastard file, 10" Flat Bastard file, 4" Warding or Contact Point file, medium knurling tool.

SCHEDULE FOR CLAMP

1. Square both ends of each piece of 7/16" square stock with an 8" Mill Bastard file to 1 1/8" long. Check with square on two sides.

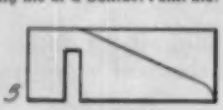
2. Paint one end of each piece with layout dope. Using a center square, scribe the center of each piece and mark the center of each piece with a center punch approx. 1/16" dia.

3. Hold the work square in a drill vise, and using a #29 (.136) tap drill, drill approx. 1/2" deep and tap with an 8-32 machine screw tap using oil. Check tap for alignment on two sides of the shank.



4. Mill slots in a milling machine using a 3/32"-wide metal slitting saw. Set the vise with the jaws parallel to the arbor, so the saw will be working toward the fixed jaw of the vise. Clamp both pieces together in vise, set the saw 5/16" from tapped end of work. Set machine to cut 5/16" deep or .312 ±.005 and take cut. Remove milling burs in the slot with a 4" Warding file or a Contact Point file.

5. To form angle, set dividers to 1/8" and scribe radius on side of stock. Measure back 13/16" from front end and scribe line from top of radius to 13/16" mark.



6. To file angle, set work in vise at an angle of approx. 20°. Using a 10" Flat Bastard file, file each piece to within 1/32" of the line. Place both pieces together in vise and finish file to line. While work is still held in vise, file radii with 8" Mill Bastard file.

7. Draw file all over with an 8" Mill Bastard file, well chalked and well brushed out to give a smooth finish. Break all sharp corners by drawing the file across each corner one stroke.

SCHEDULE FOR SCREW

1. Hold stock in three-jaw chuck allowing approx. 1" of stock to protrude.

2. Turn dia. to 3/8" using a right-hand round-nosed tool with a nose radius of approx. 1/16". Use cutting speed of approx. 75 FPM.

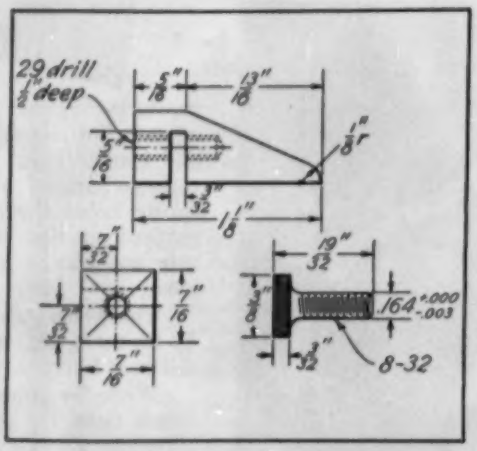
3. Knurl section for head of screw with a medium knurling tool. Set machine in lowest speed, using oil on knurling tool with a hand feed.

4. Turn screw to .164 $^{+.000}_{-.003}$ 1/2" long. This should be taken in three or four cuts as the dia. is small. Care should be taken not to take too heavy a cut on the possibility of springing the work. File radii on end of work using an 8" Mill Bastard file.

5. Cut screw with an 8-32 die in lathe, using oil to ensure a smooth thread.

6. Cut screw to length using hacksaw or cutting off tool in lathe. File head of screw and break all sharp corners with an 8" Mill Bastard file. Have checked with an instructor.

Note: The clamps should be either case-hardened or pack-hardened, depending upon shop equipment.



The Nicholson Mill Bastard, Flat Bastard and Warding files are shown reduced in size from those specified in the text.

FREE REPRINTS OF THIS PAGE

for school-shop use will be sent to school heads or instructors on individual request. Ask for "How-To Project No. 17" and state minimum number of copies you need. NOTE: The files recommended in the foregoing text can be obtained at industrial supply houses and good hardware stores.

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Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
APRIL 1956

Make Objectives Vital —

Analysis of Teaching Performance in a General Shop

MARSHALL L. SCHMITT
Associate Professor, Industrial Arts Education
North Carolina State College of Agriculture and Engineering
University of North Carolina
Raleigh, N. C.

The following is a description of a teaching performance which was conducted in the industrial-arts department at North Carolina State College, Raleigh, N. C. It was an attempt to put theory into practice, or to meet several objectives instead of, as our critics say, *one* or *two*.

The students who participated were college freshmen who for the most part had not had any previous industrial arts in high school before coming to college. The class was run very much as we would expect our graduates to operate and conduct their own classes, and like any other class, it had its objectives or targets to shoot at. Many teachers like to write their own objectives, still others in the course of their readings find authors who have written objectives in such a way that they feel they can accept them as being their own, and the latter was the case in this course.

The objectives we are speaking of are those stated by Wilber[1] in his book *Industrial Arts in General Education*.

If these objectives are accepted, then the next problem is, how to select course material to carry out these objectives. Different techniques are necessary to get at various objectives.

Selecting Subject Matter

It is almost an impossibility to discuss the selection of curriculum material without discussing methods of handling the material. We, in industrial arts, are very fortunate to have the unique setup with the project method already in use. We are equally favored in having a variety of facilities which lend themselves to the larger problems if only utilized in that way. One of our greatest assets is the fact that we use concrete materials from which to develop concepts, understandings, and problem solving. However, problem solving can be hindered to a considerable degree if we use the materials in our shops as we have done in the past. Traditionally the teacher selects a series of projects or requires certain ones to be performed by each student in the class in order to get definite manipulative experiences he feels desirable. This method is naturally teacher-centered, but does meet certain of the objectives set up by Wilber. It *does* develop a certain amount of skill in a number of basic industrial processes. It *does* have the student explore certain aspects of industrial processes and operations. It is, therefore, necessary not to disregard that method or approach but to utilize other approaches in which to meet the other objectives set forth in the beginning of the course. For instance, one of our objectives is to develop recreational and avocational activities in the area of constructive work. I wonder how effective that objective would be met when the teacher decides beforehand what projects should be made by the student. It is, therefore, necessary to deviate from tradition in order to meet all the objectives we claim. The basic approach used in this course was to use industrial arts as a fund of technical information, variety of materials and machines, and to use it whenever necessary to solve an individual problem for the learner. We sometimes deceive ourselves, I think, in trying to cover so much ground by *pouring it in* rather than letting the students see these problems and try to seek them out. The industrial-arts teacher trained in a general comprehensive shop is ideally situated to carry out the type of program with such a broad background of experience.

Methods Used

As previously stated, it is an impossibility to completely separate curricu-

[1]Wilber, Gordon O., *Industrial Arts in General Education* (Scranton, Pa.: International Textbook Company), pp. 42–43.

lum and method, since they both tie in so closely together. However, several different techniques were used and are summarized before the over-all plan is discussed. An assigned project was used to start the class. The purpose of the assigned project was to have each student go through a planning procedure experience working with two basic materials, become familiar with the shop and the tools and location of the tools within that shop. Other methods could be used depending upon the individual instructor.

A production job was conducted by the class during the middle part of the semester and this production job acted as a core for many of the processes and operations which were experienced by the entire class.

Shop demonstrations, related information, and individual demonstrations were conducted throughout the course, however, there was more concentration at the very beginning of the course on shop demonstrations and less on related information. The atmosphere in the shop was very informal and as democratic as possible.

A shop trip was eventually planned to a pottery since almost all of the students worked in ceramics. The ceramic industry was of the hand type in which a donkey was used for power to mix the clay and the kiln was a wood fired brick type. The industry was noted for its aesthetic sensitiveness to design rather than mass production techniques. A discussion of design in pottery preceded and followed the trip. The highlight of the trip was the potter who threw vases with extreme ease as the result of twenty years of experience in the art.

Shop Administration

Certain organization is absolutely necessary to keep the shop running smoothly. A regular plan sheet form was used. However, if it did not fit the project, it was not required, although some type of plan sheet was necessary. This included an isometric or orthographic drawing, list of procedure for building, and a bill of materials. The text used in the course was Groneman and Williams, *Exploring the Industries*, and Griswold, *Handicrafts Simplified — Procedures and Projects*.

A form sheet was in the consumer education report and a project file was handy (although not too well organized) for the students to use. The student also had a manila folder in a metal file where his returned plan sheets and other reports were placed. The personnel organization was developed by the students, a superintendent was elected and a committee formed to set up some kind of personnel organization and the various duties were rotated every few weeks, although the superintendent took the job for the whole term.

The General Plan

Meeting the Class. The first time the class met, the entire period was devoted to an introduction, that is, going over the general aspects of the course and shop trip to show the various facilities which were available for the students to work. The approach was to create interest. The introductions, of course, could be done away with if the students knew one another. However, this was a beginning class and many of the students came from different parts of the state and introductions were extremely important so each member of the class could call other members by their first names.

A very important aspect of the first day was the shop trip. The shop trip covered all the activity areas available in the general shop. Many projects were on display to show the students various possibilities. Some of the areas which were examined included the graphic arts, in which bookbinding, silk screen work, linoleum block cutting, letterpress printing and rubber stamp making could be done; the arts and crafts area in the shop included leatherwork, ceramics, plastics, internal carving and bending of plastic; the electrical area included general electricity and radio work; the metalworking area included foundry and art metal; woodworking and other phases within this activity such as wood turning were also examined.

The general tone of the first day was to develop a congenial atmosphere in the minds of the students so they would become interested and would look forward to their next class meeting.

The First Demonstration. At the next meeting of the class, the students were to observe their first demonstration. This is a very important meeting. It is the teacher's work and an example of what will be expected in the way of workmanship, handling of tools, nomenclature, and planning.

The project selected, as was indicated earlier, was teacher initiated, that is, each student was required to make this project. This was the method used to start the class. The project was very small and was completed by the teacher in less than two hours. It was a wall plaque made of ¼-in. plywood; on the plywood was a small copper tooled viking ship which was made from copper foil and then treated chemically to get highlights. The project was no larger than 6 in. in length and 3 in. in breadth, made freehand in an oval shape. With the proper planning, the teacher can demonstrate the project all at one sitting within twenty minutes. While the demonstration was going on, the instructor referred frequently to the plan that was made previous to the demonstration. This not only pointed out the importance of planning, but also gave the students an example of what a plan should look like.

Planning the First Project. After the demonstration, the group was brought to the classroom and a discussion of what had taken place in the form of planning the entire project was taken up in detail. Each student was given a plan and this plan was, of course, to be his own for the required project. He could deviate from the project requirement in the size of his plaque, and if he wished, he could use a different design than the viking ship which was demonstrated. As soon as each student finished his plan, computed his bill of materials, and had written his procedure, the instructor o.k.'d the plan sheet and he could begin work.

The necessary materials for the job could be located in the shop. Some students were able to begin their projects the second day they were in the shop. Cleanup in the shop was handled by the instructor the first two days with the help of several students. No organized procedure was used.

Beginning a Unit of Instruction. Just before the close of the second period, the students were asked to bring in any objects they had built as the result of hobbies they had. Three students said they would bring in examples of wood carving, radio, and woodworking projects.

The third day consisted of a review of the planning and demonstrations that were given on the small plaque and three of the students discussed the hobbies they had previous to attending the class. One demonstrated, or showed, some wood carving he had done, another brought in some wood projects he had completed at home, and the other discussed a radio although he did not have one to show. A radio was brought out from the shop which was made by a former student. Along with a short discussion on hobbies, it was brought out that hobbies not only give the individual a certain degree of skill in performance, but also give him a certain amount of self-confidence which he could not obtain any other way. It was pointed out that one of our objectives is to foster the development of the hobby, and each student was asked to critically analyze some of the activities which are available in the shop to see whether or not he might be interested in developing one of them as a hobby.

The crucial point in any program lies in the shift the student makes from the teacher-initiated project to his own —

like a bird that takes its first flight alone. A required first project is a *method* — from here out it is up to the teacher to direct learning in all its phases. A look at the objectives again helps give direction. The development of a useful hobby in this case was the first main emphasis.

Demonstration of a Hobby. After the discussion of the three students with the hobbies, they presented to the class, the instructor then demonstrated his hobby which was ceramics. He demonstrated the slab method and coil method of making pottery and discussed other methods, such as the potter's wheel and slip casting, and showed the students some ware that had been fired and glazed. This demonstration created enough interest that several students wished to begin in ceramics for their hobbies. The class worked on its first assigned project — the viking ship — the rest of the period.

Setting up the Personnel Organization. The following class period was devoted to shop organization, electing a shop superintendent and pointing out the real need for having some organization within the class. The following period, the instructor finished the slab method of making pottery and stacked the kiln for firing.

Activities Selected by Students. With the exception of the first two days which consisted of orientation and planning, the shop demonstrations or discussions took no longer than 20 to 25 minutes. This allowed in a two-hour period, ample time for the students to work and many of them had by this time completed their first project. Although many students took more than two hours to complete, one who had some previous experience completed his earlier. This period of time was extremely important because it allowed time for other demonstrations to be given and also the introduction of hobbies as an objective or real goal for the class.

Two students became interested in electricity and three became interested in ceramics. After finishing their required project, the students actually divided themselves up in six areas in the shop — wood, metal, ceramics, textiles, leather, radio.

The next general demonstrations were given in applying glazes and giving instruction for the completion of a project by the cast method. Group demonstrations were then predominant and were given as the need arose. Each student was required to have his plan for his next project o.k.'d by the instructor before starting. It was necessary in several cases, after questioning a student on his plan, to refer him to the reference books and other sources for further information before he could make his project.

Assignments. On the third week, an assignment was given to the class as a whole after all members had begun their projects. This was outlined on the board. Each student was to use the library and write out a report on the material he was using from its raw source to its finished product. For instance, a student working with wood (maple) would have to locate the source of those trees, know the industrial processes involved to make it in the form he was using: copper was another, etc. It was suggested that students working on the same material could work together. This was done in the case of wood, electricity, leather, ceramics. A written report was required and they also were told that an oral report to the class would be required.

The fourth week, another assignment was given on consumer education. The students were asked to fill out the form (see Appendix A) on an article they had purchased and then one they were planning to purchase; and then list activities they could do in the shop to help them select and find out some information concerning the problem of consumption.

Directed Learning. An opportunity for socialization offered itself in the form of participation in the State Fair held in Raleigh. The Fair served as a stimulus for the students to finish their projects for demonstration at the Fair and for participation in a co-operative group action. Each student who participated in the Fair was responsible for giving a demonstration.

Since several students express an interest in leather, a group demonstration was given to them. Much interest by students not working in leather was noticed. Other group and general demonstrations were given when needed, such as textiles (warping up a loom), use of a hand plane, turning on a lathe, use of metal and wood layout tools. During the course, a friend of the instructor happened to be in the class and noticed that some leatherwork was being done. He asked if any of the students would like to tan some fox hides. This was suggested to the class and the entire class wanted to do the tanning. A total of 12 fox hides was obtained and then the investigation, research of a tannery industry was necessary. This was also true for the instructor as he had never done this before.

Finally, after some source material was consulted, the plan was devised to prepare the fox hides. Some of the problems that had to be worked out included: Preparing a wooden beam for fleshing, dehairing, mixing the tanning solution, and working the oil in the hide. It was necessary to follow the complete industrial process from the hide to the tanned leather.

Even though there were not enough hides for each student, the entire class kept up with the procedure. It formed a core of common information and center to examine an industry firsthand within the limitations of a school shop. Some humor also came out of the tanning, such as, one student left his fox hide soaking too long and the hair came off, and another fox hide putrified and a strong stomach was needed to remove and dispose of the hide.

Related Information

When the class seemed to be well under way on their second project and some students starting on their third, the teacher held a general discussion in the field of ceramics. Since this was demonstrated as a hobby, some of the values of having a hobby were discussed by the class. In addition, the history and the development of the ceramic industry were discussed and some of the technical terms relative to the manufacturing processes peculiar to the ceramic industry were discussed. Many different types of projects were shown and several teaching aids were used during the discussion. The discussion lasted about half an hour. It was also pointed out during the related lesson that each of the committees that was organized earlier would be asked to control the discussion at some future date. In fact, the day was actually decided upon in the next class session.

The following discussions were held by the group and the various students reported on the manufacture of copper, how it related to their projects, the manufacturing processes and difficulties encountered in getting wood in its present form in the shop. This concluded the discussion about kiln drying and lumbering.

Since one student worked in plastics, his related information was of an individual report nature and contained some very good, useful information on the various processes involved in plastics.

Since two students worked in textiles, they demonstrated and showed the group how a loom operated and also exhibited the two scarfs that were made.

Three students talked about communications and the various aspects of electricity. A mock-up was used in one case to discuss how power is brought into the home and a small amount of theory was discussed on the radio receiver.

By far, the most fruitful discussion was held on the leather industry, which was, of course, a part of the production job. Many points were brought out not

only from the manufacturing aspect of the industry, but in the purchasing of leather goods.

All in all, there seemed to be considerable interest displayed by the students during these short discussion periods. Some of the discussions lasted only ten minutes while others took as much as twenty.

Manipulative Experiences

All through the course, the emphasis was *not* placed on securing certain manipulative experiences. The manipulative experiences grew out of real problems to be solved, such as the other students working out individual problems, developing hobbies, etc. Some students were required to make projects over again or make some changes to develop their craftsmanship as much as possible, allowing enough freedom within the course to encourage as much creative expression as possible.

The following is a listing of the various projects that were completed by the students in the shop. A breakdown of the manipulative experiences is not included although a person with some past experience in industrial arts can readily see the large variety of activities that were experienced within the 11-week period, 6 hours a week, which is a total of 66 hours. In addition to the projects, each student was requested to aid in keeping the shop in tiptop condition by contributing a certain amount of time for shop maintenance. This varied with each student — some putting in more time than others.

Student No. 1 — Wall plaque, picture frame, letterhead (printing)

Student No. 2 — Wall plaque, Toby mug (ceramics), beer mug (ceramics), stepladder (wood)

Student No. 3 — Wall plaque, fox hide, wood candleholder (turned on the lathe, later used to cast a ceramic candleholder), letterhead on the printing press, 1¼ hrs. maintenance

Student No. 4 — Wall plaque, beer mug, two French vases, one green vase, one Toby mug (all ceramics), book ends, lamp, 5 hrs.' maintenance

Student No. 5 — Wall plaque, fox hide, serving tray, metal tray, repaired iron cord, turned in notebook, 1 hr. maintenance

Student No. 6 — Wall plaque, fox hide, napkin holder, 15 hrs.' maintenance

Student No. 7 — Wall plaque, fox hide, scarf, lanyard, ¾ hrs.' maintenance

Student No. 8 — Wall plaque, fox hide, French vase, cornucopia vase, Grecian vase, duck, Toby mug, beer mug, 3 hrs.' maintenance

Student No. 9 — Ash tray, experimented with different types of glaze in ceramics, 4 hrs.' maintenance

Student No. 10 — Two wall plaques, wood pattern, casting, machining on the casting. No maintenance

Student No. 11 — Wall plaque, two Toby mugs, horn vase, 4-tube radio, 3 hrs.' maintenance

Student No. 12 — Wall plaque, scarf, leather billfold, 2½ hrs.' maintenance

Student No. 13 — Wall plaque, lamp, 1 hr. maintenance

Student No. 14 — Wall plaque, magazine rack, no maintenance

Student No. 15 — Wall plaque, fox hide, flower pot, Toby mug (ceramics), 5½ hrs.' maintenance

Student No. 16 — Wall plaque, mallet (wood turning job), 3¼ hrs.' maintenance

Student No. 17 — Wall plaque, fox hide, beer mug, cornucopia vase. French vase, Maxwell automobile, 1¾ hrs.' maintenance

Maintenance activities varied considerably depending upon the needs of the shop, from repairing a machine to straightening out the library books. Whatever was the need, the student's time was placed on that job to keep our shop running as close to top efficiency as possible.

Evaluation

Several different types of evaluative techniques were used during the course. They are as follows:

1. Observation of student's work.

2. Reports, written and oral. One was a report on the material to the class and the other was a specific assignment on electrical work.

3. Tests. One mid-term was given and a final examination.

4. Quality of work done in the class. This was an average of all project grades.

5. Quantity of work done. This was the amount of work done by each student compared by the others.

6. Class evaluation sheet at the end of the course. This was primarily for the instructor's evaluation.

At the end of the course, one student received an *A*, eight received *B's*, five received *C's*, two received *D's*, and one *F*.

Analysis of After-the-Class Evaluation Slips. After the final examination in the course, the students were asked to answer 12 different questions concerning the course itself. After each of the questions, a summation is given from the comments received. The students were asked not to write their names on these evaluation slips. The questions asked and the comments were as follows:

1. *Did you have a hobby before you started this course?*
   a) What was it? b) Did you acquire any here in the shop? c) Please name it.
   (With regard to 1(*a*), nine nos, seven yeses, and the following activities were suggested: photography, model building, radio, woodwork and stamp collecting. With regard to 1(*b*), nine yeses, three nos, one "in a way," and one "not sure," one no answer, one building model airplanes and lanyards. With regard to 1(*c*), woodworking, wood area, ceramics and embossing, wood and ceramics, ceramics.)

2. *Did you learn any basic industrial processes as the result of this course? Please list.*
   (For clarification, the following eight classifications were established: (1) metals, (2) textiles, (3) leather, (4) ceramics, (5) wood, (6) electricity, (7) graphic arts, and (8) plastics. Under the general classification *metals*, the following were listed: foundry, iron, copper, production of copper, copper, aluminum, more about metal casting, mining of copper, copper, metal, foundry, metal lathe. Under the classification *textiles*, weaving, weaving cloth, textiles. Under the classification, *leather*, tanning, leather, process of tanning, tanning liquor, production of leather, little about tooling leather, furs, leather, hide tanning, fur tanning. Under the classification *ceramics*, pottery making, making clay, the way pottery is made, the methods used in getting a finished piece of pottery, ceramics, process of making ceramics, pottery making, casting, potter's wheel, clay making, glazes and firing pottery, ceramics, ceramics from plastic clay to finished product, ceramics: how pottery is made, commercial pottery manufacturing. Under the classification *wood*, furniture making, how finishes are applied, plywood, finishing, woodwork, wood, how furniture is constructed. Under the classification *electricity*, operating telephone and telegraph. Under *graphic arts*, printing. Under *plastics*, plastics.)

3. *Did you feel you could select, design, and plan your projects pretty much on your own?* Thirteen yeses and two nos. The following comments were observed:
   a) "Some projects, yes; some projects, no."
   b) "At first I didn't think I could select, design, and plan projects, but later, yes."
   c) "Very hard unless you have done a lot of reading when it was a new process. Required a lot of thinking, also I was not

sure about some steps without approval from instructor."

d) "To a certain extent, yes."

4. *Do you think the shop was operated informally (explain your choice)?* All but two of the students indicated "yes" on their evaluation slips. The following comments were observed:
   a) "A little too informally, the fellows who wanted to work were at times hindered by those who didn't."
   b) "You were allowed to get help in the work. There was no cramped atmosphere."
   c) "The shop was operated o.k."
   d) "At times I felt it was too informal."
   e) "It was operated in a good fashion."
   f) "Because you could work at things in your own way."
   g) "To a certain extent, but could be improved."
   h) "Everyone helped to run the shop and no one had to do it all."
   i) "I think it was operated so as to give each person some responsibility and I think that is best."
   j) "Supervision wasn't too strict. Were allowed freedom to talk or ask advice of others, get a coke when you wanted it, etc."
   k) "I think so because one was allowed to work on what he wanted and everyone was in on cleaning up the shop."
   l) "We chose our own projects and worked on them as we wanted, getting information from you as we needed it. Sometimes making mistakes before we saw you about needed information, but lessons learned from mistakes are not forgotten."
   m) "Because there was less authority shown by the teacher and superintendent. This type of informality makes the course more enjoyable and interesting."
   n) "I think this shop was run the way one should run. We had our choice of projects and fields of work in which we were interested. We had it organized so that at a specific time we would quit and clean up the shop. The students and teacher co-operated with one another."
   o) "The shop was operated very informally. Only one small project was required. A man could work on any type project he wanted, also the discussions were conducted on an informative give-and-take basis. Very good discussions, I think."
   p) "We were pretty much on our own and we could try to work out our problems together and give suggestions or help if needed informally. Also, the informal discussions we had on the history of working materials, however, when problems came up that we could not overcome, the instructor was always there with helpful advice."

5. *Do you think you developed a degree of skill in some areas of work that you did?* All but one indicated "yes." The following comments were received:
   a) "I am certain that I did."
   b) "To a very, very slight degree in plastics."
   c) "A little in the use of making of plastics."
   d) "To a slight degree."
   e) "A certain amount."

6. *Did the shop work challenge your thinking?* All of the students indicated "yes." The following comments were observed:
   a) "To a great extent it did."
   b) "Some."
   c) "It got me to think about how other things are made and done."
   d) "I would not go so far as to say it was challenging, but I think several things we did, especially the tanning of the fox hides, was thought provoking."

7. *Do you think you learned anything that will help you to be a better consumer of goods?* All of the students indicated "yes." The following comments were observed:
   a) "Especially in the ceramics area."
   b) "Very much."
   c) "I learned a lot of things to look for when purchasing different items."
   d) "Very much so."
   e) "Some."

8. *Do you feel that you can appreciate good craftsmanship to a better degree than before this course?* Fifteen of the students answered "yes." The following comments were received:
   a) "Somewhat, again in the ceramics area."
   b) "Definitely."
   c) "In some things, yes."
   d) "Definitely."

9. *What didn't you like about this course?* The following comments were obtained:
   a) "Too many areas for one course."

Assembling the new lamp in the home-mechanics laboratory, Chicago Public Schools, Louis V. Newkirk, director of industrial arts

b) "Too informally operated at times. Tools not kept in good shape."
c) "Too indefinite."
d) "I liked it very much."
e) "It was not boiled down to something you could study. There were too many areas to learn about without any printed textbook to study. Certain areas should be separated into different courses."
f) "It has been too indefinite as to what was expected of us. We did not know what we were expected to know."
g) "Materials were too hard to find. It seemed like every time I needed something we were out of it, or I couldn't find it; at least, it took a long time to locate it."
h) "Not enough on electricity."
i) "The informality of the course."
j) "I was very well satisfied with the course, in fact, I would like to have another quarter of it."
k) "Time allotment, which could not be helped."
l) "It was all right in all ways except that there should be more printed matter to look over."
m) "It covers a wide area and gives us a general overall understanding of industry."
n) "Working in different areas."
o) "I only did the things in which I was interested."

10. *How did this course compare with other courses you have taken?* The following comments were given:
a) "More interesting."
b) "Exceeds the rest."
c) "More advanced."
d) "Most interesting."
e) "It has a much wider scope."
f) "That is hard to say."
g) "The best."
h) "Not as interesting as most of them, but the trouble is with me, not the course. I am taking this course out of sequence."
i) "Good."
j) "It did seem familiar to other courses in the woodworking field."
k) "This is my most interesting one."
l) "To me, there is no comparison to this course and English and chemistry."
m) "Excellent! Best course I have had privilege of taking."
n) "This is a hard question. I have never taken a course with as many different activities available. I liked this one because of that."
o) "Favorably."
p) "Less formal than others, more freedom of expression, more interesting than others."
q) "I think this is the most interesting course I have taken in the shop because I had the privilege to work in any field I wanted."

11. *How can we improve this course?* The following comments were received:
a) "By improving the things mentioned in question 9."
b) "More terms of it; helps better to get to discover details of interest."
c) "By working in one area for a little while, then another, until we have seen some of the possibilities of each one."
d) "I think this course could be improved by providing more hours so there could be a wider field to cover in this course."
e) "By having a little more notes written up on various processes in the shop, and how they are done."
f) "This course covers such a wide area that I don't think it could be improved unless we have more time."
g) "I can't think of any."
h) "Let students have more time to work."
i) "I haven't any suggestions. I think it is run good now."
j) "I believe it serves its purpose."
k) "Make grades a matter of little importance so fellows wouldn't have to worry about something to be graded on. They would feel freerer to experiment and do such things as tan hides. Encourage fellows to work in all different areas and let fellows share or see what others are doing. Assign definite reading."
l) "This course in particular, I don't know. All the shop courses, in general, arrange materials in the supply room so they can be found and a check kept on them so they may be recorded when stock is low."

12. *Any other comments listed here.* The following comments were made:
a) "Good teacher."
b) "None."
c) "None."
d) "None."
e) "None, except it was an interesting and educational course."

Instructor's Comments on the Class. After reading the description of the course, one can see that it was not a radical departure from any accepted practice, but rather a shift of emphasis from a teacher-initiated course primarily to one of a co-operative planned course using the students' interests and desires as well as the teacher's goal in the development of the course. It might be said that the course evolved toward large over-all objectives. How well the objectives were received is for you to decide. You be the judge — is it good practice or bad practice?

A Real Job to Tackle —

Design Analysis

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In striving to achieve the objectives of industrial arts we perhaps fail most often in our attempts to instill in the student the values and basic fundamentals of well-designed articles for everyday living. As prospective producers and consumers of these articles the student should receive continued guidance as early as possible, as an integral part of the regular shop instruction.

Defining the "Art" in Industrial Arts

It is a common error to think of art as merely the application of a media to a canvas, or chiseling an object from a solid mass of material. While it is true that both painting and sculpture are aspects of art, to say that they *are* art in its entirety would be limiting the scope to a few individuals and would make previous and present-day civilization devoid of art indeed. Creations of art were formed long before man ex-

tracted pigments and forged metals capable of chipping stone. Nor had early man developed a system of written documentation, yet his remaining artifacts tell us much about him. His art was a fundamental need to insure his very existence and meager comfort.

Let us define art in terms of early man still further. To the learned archaeologist a primitive vessel may disclose an estimated *cultural level* of a certain race or region of people by determining its intended function. Furthermore, the object could measure the *accumulated knowledge* by the processes the material had been subjected to. Another, and more obvious factor, would be the *skill* displayed throughout its fabrication.

While our *culture, knowledge,* and *skills* have most certainly advanced since very early times, they would be criteria for some future archaeologist to follow in evaluating our civilization. We could say then that the fundamentals for evaluating art never change, but the resultant expression does as man strives to satisfy a need with all the ingenuity and cunning at hand. We might also add that any man-made thing is art, we are all *artists,* but it is of good quality only to the degree that knowledge and skill are displayed.

Art for us in the field of industrial arts would embody the use of the mind, hands, and the continuation of our hands in the form of tools and machines, in making something for a purpose and making it well.

Design

We are sometimes given the impression that design is the process of ornamenting by the removal of, addition to, or rearrangement of, specified areas of an object's surface. Design entails much more than that. Design is the thinking through, the planning to arrange various visual elements to satisfy the function, the material, and the formative processes required in producing a well-made object. To properly understand the latter statement, further explanation of design and its composition is needed.

Analysis for Design

It has been stated that design is a plan. A plan being a scheme of action for analyzing and carrying out an idea. Not only will the plan aid the artist in understanding just what he requires his project to do, but it will also determine, to a large degree the arrangement of the *visual elements* such as: *line, shape, mass, tone, color, texture,* and *space.* Below are listed the points one might follow in analyzing a creation. The writer has found it very helpful in evaluating his own work and in aiding students to evaluate the efforts of others.

Functional needs — Here one must answer the question: "Why make this?" "Is it an object to sit upon, eat with, or wear for personal adornment?"

Human needs — One must specify here the provisions to be made for the people working and living around the creation. "How will it fit into the human environment?" Examples of this might be: a bowl which is not easily tipped over, or a lamp that may be operated by all persons who are to use it.

Technical provisions — Consider here the requirements that might determine the materials to be used, or the size and shape that would be demanded by function and environment.

Economic requirements — Determine what limit in cost and in time would be allowed to make the creation.

Dynamic considerations — List the answers to the question: "What forces are to be overcome, and in what manner will they be applied?" For example: a toy box which must support vertically the weight of an assortment of toys as well as a 300 lb. human load. Also, the box must be capable of withstanding a horizontal force as that of a falling youngster.

Social needs — Note here what the creation will do in the form of satisfying certain social implications. Example: It must display a feeling that the materials were properly selected.

Psychological needs — This phase of the analysis would ask the question: "What mental impression must the object impart upon those about it?" For example: a chair should promote a feeling of comfort and stability.

Skill level — Here must be ascertained the level of the individual who is to make the object. What degree of skill would be required to fully meet the above points in analyzing a need.

The Principles of Design

As previously mentioned, culture level, accumulated knowledge, and skill are factors known to govern past, present, and future generations in their art work. While various periods of furniture and architectural styles have flourished with individual artists, groups, and movements, they have had these factors in common to limit or expand their ideas. They have had and will have major principles to be satisfied in common also. These principles would be *rhythm, balance,* and *emphasis.*

Contrary to some belief in our field that any principles of design need to be completely "rejected" in designing is felt by the writer to be sheer folly. In effect, it is comparable to an ocean voyage with no compass nor knowledge of star navigation, and headed toward no particular port.

Rhythm is primarily concerned with giving an object unity. It is a recurring pattern which repeats an accent or motif to *tie an object together.*

Balance and rhythm depend upon each other to the degree that without one the other is lost. Balance gives the object stability whether it be symmetrical or occult.

Emphasis is the arrangement of the *visual elements* which enable the eye to move to the area the creator wishes attention focused upon.

Together, and they are inseparable, the principles can convey feelings in art work of informality, tradition, dignity, and innovation.

Summary and Conclusions

Students need the experience of analyzing their projects through a systematic check list. They would also benefit greatly the opportunity to subject the work of others to the same treatment. This may be carried out by the incorporation of a design analysis system in the regular plan sheet form.

Students must also be aware of the fundamentals of art. They must realize that their resultant project can be no better than their knowledge and skills in the use of tools, materials, and processes.

All things of the universe are contained in the visual elements of line, shape, mass, tone, color, texture, and space. These elements are ruled by the principles of art which are: rhythm, balance, and emphasis. The degree to which the principles are satisfied will determine the creation's beauty and psychological effect on those who use or look at it.

Photograph by Carolyn Tenney, Graphic Arts Department, Tucson Senior High School, Tucson, Ariz.

Submitted by Harry A. Goldstein, Instructor

For Teacher-Student Satisfaction —

Grade Your Students Objectively

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Personalities often creep into the picture of grading a student. Are you grading your students fairly? Can you explain to a student why he received a *C+* on a project while some other student, with a similar looking project, received a *B—?*

Here is a system of objective grading that will never leave you *red faced*. It has been used for the past five years with a great deal of success. Figure 1 shows an analysis chart such as is used with beginning classes. There is a chart for each student and these are pinned on the bulletin board in order that each student may see how his project is graded and what points he must stress to the development of a better project.

Let us examine a typical case. In grading the first problem, rectangular roof jack, I refer to the student's analysis chart and proceed down the column of operations. Those operations that are numbered under the project in question I grade with a *U* for unsatisfactory, an *S* for Satisfactory, and an *E* for excellent. This is a method that can be easily shown to the student and just as easily understood by him.

In grading the student on operations, a check sheet must be carefully written and improved upon as time teaches. I have listed several examples at the end of this article that would be typical of most shop situations.

Figure 2 is what an analysis chart looks like after having graded all of the projects.

To evaluate these problems into letter grades let us examine Figure 3. You will note that *U* is a failure and receives no points, *C* is satisfactory and receives 5 points, *A* is excellent, and is assigned 11 points.

F = 0 = *U*	D+ = 3	C+ = 6	B+ = 9
D— = 1	C— = 4	B— = 7	A— = 10
D = 2	C = 5 = *S*	B = 8	A = 11 = *E*

Figure 3

By substituting numerical values for *U*, *S*, and *E*, in the example analysis chart, adding the totals and dividing by the number of operations involved, we arrive at a decimal value. It is this value which determines the student's grade. For example, the total points made by the student on the rectangular roof jack total 47. If we divide this value by the number of operations performed; $\frac{47}{9} = 5.2$, we see that our decimal is closer to 5 than 6, so the student receives a *C* on his problem and justifiably so.

Listed here are a few examples taken from various "operation check sheets."

Operation Check Sheet for Sheet Metal

I. Read a blueprint
  A. *Unsatisfactory* (2 or more)
    1. Student constantly asks ques-

Name

Date

Section

PROBLEMS / OPERATIONS	RECT. ROOF JACK	RND. ROOF JACK	"T" OF LIKE DIA.	"T" OF UNLIKE DIA.	45° OF UNLIKE DIA.	60° TANGENTIAL	90° ELBOW
1. READ A BLUEPRINT	1	1	1	1	1	1	1
2. PLAN A PROCEDURE			2	2	2	2	2
3. MAKE A BILL OF MAT.				3	3	3	3
4. LAYOUT	4	4	4	4	4	4	4
5. IDENTIFY METAL	5	5	5	5	5	5	5
6. CUT METAL, S.S.	6	6	6	6	6	6	6
7. CUT METAL, SNIPS	7	7	7	7	7	7	7
8. PUNCH A HOLE			8				8
9. DRILL A HOLE				9	9	9	
10. FOLD A GROOVED SM.	10	10	10	10	10	10	10
11. LOCK A GROOVED SM.	11	11	11	11	11	11	11
12. FOLD IN A BRAKE	12						
13. FORM IN SLIP ROLL		13	13	13	13	13	13
14. SOLDER	14	14		14	14	14	
15. RIVET			15	15	15	15	15
16. BURR				16	16	16	
17. ELBOW EDGE							17
18. CRIMP							18
TOTAL POINTS							
GRADE							

Fig. 1. Chart for the individual student

Name / Date / Section — PROBLEMS / OPERATIONS	RECT. ROOF JACK	RND. ROOF JACK	"T" OF LIKE DIA.	"T" OF UNLIKE DIA.	45° OF UNLIKE DIA.	60° TANGENTIAL	90° ELBOW
1. READ A BLUEPRINT	U 1	U 1	S 1	S 1	E 1	S 1	S 1
2. PLAN A PROCEDURE			S 2	U 2	S 2	S 2	E 2
3. MAKE A BILL OF MAT.				U 3	E 3	E 3	E 3
4. LAYOUT	S 4	S 4	S 4	E 4	E 4	S 4	E 4
5. IDENTIFY METAL	S 5	E 5	E 5	S 5	E 5	E 5	E 5
6. CUT METAL, S.S.	E 6	E 6	E 6	E 6	E 6	E 6	E 6
7. CUT METAL, SNIPS	E 7	E 7	E 7	E 7	E 7	S 7	E 7
8. PUNCH A HOLE			S 8				E 8
9. DRILL A HOLE				E 9	E 9	E 9	
10. FOLD A GROOVED SM.	S 10	S 10	E 10	E 10	E 10	E 10	E 10
11. LOCK A GROOVED SM.	S 11	S 11	E 11	E 11	E 11	E 11	E 11
12. FOLD IN A BRAKE	S 12						
13. FORM IN SLIP ROLL		E 13	E 13	E 13	E 13	E 13	E 13
14. SOLDER	U 14	U 14		S 14	S 14	S 14	
15. RIVET			U 15	U 15	S 15	E 15	E 15
16. BURR				S 16	E 16	E 16	
17. ELBOW EDGE							E 17
18. CRIMP							E 18
TOTAL POINTS	59	47	86	97	136	124	148
GRADE	C	B—	B	B—	A—	B+	A

Fig. 2. Individual chart with all projects graded

tions that are answered on the blueprint.
2. Dimensions are wrong.
3. Gauge of material is wrong.
4. Type of material is wrong.

B. *Satisfactory*
1. Either 3, or 4.

C. *Excellent*
1. None of the above.

II. Identify Metal

A. *Unsatisfactory* (2 or more)
1. Gauge is wrong.
2. Type is wrong.

B. *Satisfactory*
1. One of the above.

C. *Excellent*
1. None of the above.

NOTE. It will be noted that there is an overlapping of some operations with others; the instructor must be careful not to charge the student twice for the same mistake.

III. Fold for a grooved seam

A. *Unsatisfactory* (2 or more)
1. Seam too wide or too small.
2. Seam tapered.
3. Radius setting on bar folder incorrect.

B. *Satisfactory*
1. Either 1 or 3.

C. *Excellent*
1. None of the above.

Operation Check Sheet for Hand Woodwork

I. Rip a board

A. *Unsatisfactory* (any 2)
1. Board tapered.
2. Cut not at 90° to stock.
3. Using a crosscut saw.
4. Board too wide or too small.

B. *Satisfactory*
1. Number 3 only.

C. *Excellent*
1. None of the above.

II. Sharpen a plane iron

A. *Unsatisfactory* (any 2, or 3 alone)
1. Not ground with proper crown.
2. Not ground at proper angle.
3. Blade burned.
4. Crown not centered.

B. *Satisfactory*
1. Any one above except 3.

C. *Excellent*
1. None of the above.

III. Drill a hole*

A. *Unsatisfactory* (any one)
1. Oversize or undersize hole.
2. Too deep or not deep enough.
3. Hole not in proper place.
4. Splintering due to drilling.

B. *Satisfactory* (not possible)

C. *Excellent*
1. Avoiding all of the above.

Operation Check Sheet for Machine Shop

I. Turn a Square Shoulder

A. *Unsatisfactory* (1, 2, or any other two combined)
1. Turned too small or not turned small enough.
2. Not 90° to center axis.
3. Rough finish.
4. Incorrect fillet.
5. Not breaking the arris.

B. *Satisfactory*
1. Either 3 or 5 of the above.

C. *Excellent*
1. None of the above.

II. Straight turn between centers

A. *Unsatisfactory* (any one)
1. Too large or too small.
2. Tapered.
3. Rough finish.

B. *Satisfactory*
1. Not possible.

C. *Excellent*
1. Within tolerance.

III. File in a bench vise

A. *Unsatisfactory* (1, 2, 3, or 4 and 5)
1. Stock not flat.
2. Stock not square.
3. Rough finish.
4. Using wrong file.
5. Using file wrong.

B. *Satisfactory*
1. Either 4 or 5 above.

C. *Excellent*
1. None of the above.

*This is typical of several operations that are of the, *either you know, or you don't know*, type.

If we are supposed to teach operations, why not grade operations. It's much more fair to the student and he'll know why his project was a C+ instead of a B—.

ONE INDUSTRY — 2000 JOBS

According to a survey conducted by the American Petroleum Institute, the oil industry provides jobs for more than 1,650,000 people — one out of every 38 of the nation's total labor force. These jobs represent more than 2000 different trades and professions. Progress in developing new and improved oil products calls for capable personnel with diversified skills. — *Petroleum Newsnotes.*

History has shown that for every job eliminated by machines, many new ones are created through the introduction of new and better products or services. — *Dr. Haldon A. Leedy.*

Henry Loats, specialist in elementary industrial-arts teacher training, Ball State Teachers College, Muncie, Ind., is pictured giving a demonstration to a student on the techniques of soldering

Photography by Bernard R. Josif

Industrial Arts and Vocational Education

JOHN J. METZ, Editor

CHOOSING THE SCIENCE TALENT SEARCH FINALISTS

IN THESE days when one hears so much about the dearth of scientists, engineers, and technicians, it is heartening to scan over the report of the Annual Talent Search sponsored by the Westinghouse Electric Corporation, and learn that 20,828 aspirants tried out in this nationwide scholarship competition.

Out of this huge number, the highest since the search was started in 1942, thirty-two boys and eight girls were selected as the most prominent future scientists in our country.

These forty youngsters were given an all-expense trip to Washington, D. C., to take part in a five-day program which would permit the final selection of the top winners to whom the Westinghouse science scholarships should be awarded.

It is interesting to note that the finalists came from 20 different states, and the District of Columbia, and that all of them were high school graduates.

New York State again is in the lead in the number of winners — five boys and two girls. California came next with four boy winners.

The states of Illinois, Indiana, and Minnesota tied for third place with three winners each. Arizona, New Jersey, Virginia, and Wisconsin each sent two winners.

The District of Columbia, Georgia, Iowa, Maine, Maryland, Massachusetts, Michigan, Montana, Oklahoma, Oregon, Pennsylvania, and Washington sent one winner each.

These finalists were selected on the basis of their showing in a very difficult science aptitude test, an evaluation by their teachers, their school records, and their own science projects.

Out of the 20,828 students from the District of Columbia, and the 48 states of the Union, 3,375 completed the entrance requirements. Out of this group, 2,728 were boys and 647 girls. Since this was a ratio of approximately 81 per cent boys and 19 per cent girls, that same ratio was used to determine the number of boys and girls that were to be selected for the forty finalists.

The career goals of the trip winners vary considerably, but all want to enter the various fields of research. Fourteen of these young people plan to become physicists — seven specializing in the nuclear branches of this science. Eight aim to be engineers, and five want to enter the field of biology. Three are preparing for careers in mathematics, two in psychiatry, and two in biochemistry. There is also one who wants to be a chemist, another an archaeologist, and then there is one who will strive to be an astrophysicist, a pathologist, a physician, and one who wants to prepare to be a paleontologist.

These young people have freely made their choices. No state official has decided for them what courses they are to take, or what field they are to prepare for. Russia may herd thousands into their technical schools, but our students have a free choice. Interest and earnest application make the work of acquiring knowledge easy. The forty young scientists, and many of those in that group of 20,828 who tried but did not quite succeed, give us a definite assurance that America need not fear the force-fed scientists of Russia and its satelite states, and the many technicians that they are training.

Teachers must all work together that our students become cognizant of the value and need of having more scientists, mathematicians, engineers, and teachers. We must encourage them to make a choice and help them to succeed. Adding such promising aids to the many brilliant minds who have made our country what it is, we need not fear the hordes with which the communists may threaten us.

Someone has said that there are seven Chinese and Russians for every American. Then our problem is to make every American better than seven communists.

APRIL, THE U.S.O. MONTH

USO serves men and women in the armed forces and their dependents. It is a voluntary, civilian federation of seven national organizations, and is responsible to the President of the United States and the Secretary of Defense.

USO now has 208 units in this country and 25 overseas. In the United States it operates clubs, troops-in-transit lounges in transportation terminals, and co-ordinates the recreation facilities of towns jointly affected by heavy military installations. USO carries out extensive programs for military and naval maneuver areas.

The 25 overseas units are located in Anchorage, Fairbanks, Nome, Kodiak, Balboa, Cristobal, Nice, Cannes, Golfe-Juan, Villefranche, Paris, Casablanca, Athens, Salonika, Rhodes, Istanbul, Naples, Rome, Seoul, Okinawa, Guam, Manila, Tokyo, and Honolulu.

During the twelve months ending November 30, 1955, members of America's armed forces made 42,717,701 visits to 233 clubs and centers conducted by USO throughout the world.

Also during this period nearly 80,000 volunteers put in about 5½ million man-hours serving the 3,000,000 men and women in the armed forces at the present time. Approximately half of our service men and women are overseas, and about 25 per cent of them are under 21 years old.

Service men and women took part in USO's dances, picnics, and parties more than ten million times. Approximately two million service personnel attended USO discussion groups, classes, and concerts, or participated in concert tours.

Religious sessions (other than church services) were sponsored by USO for 16,500 groups of the three major faiths, drawing an attendance of nearly 800,000.

USO member agencies are the Young Men's Christian Association, the Young Women's Christian Association, the National Catholic Community Service, The National Jewish Welfare Board, The Salvation Army, The National Travelers Aid Association, and Camp Shows, Inc.

April, 1956, has been designated the USO Month to emphasize to the American people the need for continued awareness and appreciation of the service and sacrifice of a large and important segment of the youth of this country — those three million young men and women who have left their homes, some even their country, to serve in the armed forces, for the protection of our people.

This organization is even more important now than during a fighting war when the upsurge of national patriotism keeps the service man and woman in the public affection. It continues to offer to service men and women the same kind of religious, spiritual, social, welfare, and educational programs which were available to them through the voluntary agencies back home.

Probably shop teachers can help make their local USO activities more effective during the coming year.

Problems and Projects

PRACTICAL DESIGN WITH NEW MATERIALS

ALEXANDER F. BICK
Teacher in Milwaukee Schools
The Milwaukee Downer College
The Stout State College, Summer Session

Here are six simple projects: (1) a plant tile in blue which will withstand heat, acid, and wear; (2) a coffeepot stand in colored tiles; (3) a letter file, also in colored tile; (4) a bookstall, to park books upright; (5) a tile tray; and (6) a hot dish tile in green and brass.

The first reason for this article is to outline a method of design. The second is to furnish steps in the making of projects using new materials.

What do new materials mean to you, and what do they hold for the student? If you agree to their value, an already heavy load is hardly a reason for holding back their benefits, especially since, in this case, fully outlined work may be assigned to student groups without preliminary experimentation. This would relieve the busy teacher of most or all of the expected involvement or complication usually attending the introduction of new material. What may seem involved at first sight actually boils down to just common processes, not as complicated by any means as the mixing of six or eight ingredients by girls in home economics. Here, boys mix a synthetic liquid with just one other liquid to produce a glass-hard substance which forms in 20 to 30 minutes, without machinery or heat

Fig. 2. The needed supplies laid out on disposable paper or aluminum

— really the most practical and ideal example of new materials.

Teaching Shop Design

In the opinion of many designers, teaching design is not a matter of lectures on design, or of showing what is bad design and what is good. Talks on rules and laws have killed more natural designers than have inspired them. Yet, any boy with a box of dominoes can arrange interesting and well-balanced patterns without benefit of formal instruction. The *domino* method used herein, may be considered a basic lesson in design.

Design is a large word embracing a family of important elements, such as form, surface pattern, texture, finish, open space relationships, timeliness, fitness, color, etc.

Design in Color

The first project, the plant tile, introduces the techniques of both color selection, and of handling the new material.

1. The first lesson, selection of color, limits the range of color. The teacher must control the lesson. He should select a simple range to avoid the temptation in children of indiscriminate use of color. Give the student blue, green, and white, out of which he may mix blue, green, blue-green, peacock blue, turquoise blue, and lighter shades of each. This includes colors dominant in most living nature, the sky, and sea. Their connotation is life, depth, power, eternity, etc. To add red to these would kill them, though we sometimes add a spot of gold. I prefer these colors to earth colors such as umber, ochre, and sienna, which, being autumn hues, denote a recession of life. You may not want to think deeply of color philosophy, yet, it is important enough in a therapeutic way (and in a school way) to demand more attention than is accorded its study.

In good design, one color, as well as one motif, should dominate the composition. There should, therefore, be more of one color, less of a secondary, and a touch of a third. The proportion may be 4–2–1, or 7–3–1, or any pleasing similar ratio of one to the other.

In the first project, there is one dominant surface color, with a secondary on its edge. When one dominates as much as our surface color does, it should be rather neutral than bright. Therefore, we select a soft dark blue, with a blue-green edge. One color alone may easily be monotonous. The secondary strengthens the first. Colors with character do not often come out of cans: they are given character by the manner of their application or by mixture. Character in color, briefly stated, is three-dimensional color, as when a second shade or hue is present through the first. Sometimes this is created by shadow from texture, and sometimes by fillers, and by admixtures of one or two toning colors. The most beautiful colors in my memory are the translucent colors in a rainbow, which have depth from displaying other tones through the base colors. This will explain the point. Students appreciate knowing these basic facts before they start making the first tile. Let them cut a piece of plywood or Masonite, ¼ by 5½ by 5½ in. shaped to express the newness of time. See Figure 1.

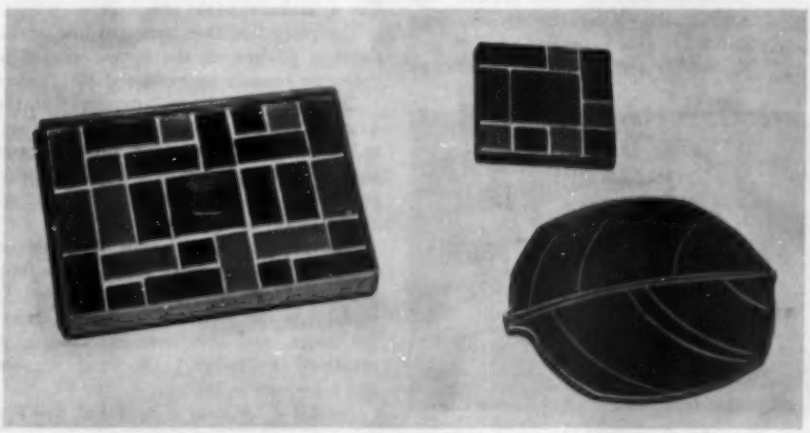


Fig. 1. Tiles made on Masonite with flowed-on coatings of new plastics

Arranging the Supplies

Set all the needed supplies in order on a paper-covered bench: Castoglas, hardener, mixing cup, measuring spoons, eye dropper, stirring stick, Castosil (a finely divided silicon filler, thixotropic in action or run preventative), and the Castoglas colors blue, green, and white. Provide a sheet of

glass or plywood to set and carry the tile on, and a wiping cloth.

Mixing the Plastic

Measure 2 tablespoonfuls of Castoglas liquid plastic into a measuring cup, add 12 drops of hardener, and stir. Add a teaspoonful of Castosil, and stir out all lumps. Open color jars, and dip out an amount of blue on the tip of the stirring stick equal to a dried pea. Mix this into the plastic. Wipe the stick, and add a slight amount of white. The student may also add green until the shade pleases him. With just a natural play of judgment, he may mix a good color. Hold him to the three colors given, and he will be on the safe side. Avoid mixing too much color into the batch so that hardening may not be inhibited.

Coating the Tile

Pour the contents of the mixing cup over the surface of the tile as shown in Figure 3 directing the flow with a stirring stick. First, smooth it out up to all edges, working from the rear of each edge; then fill the tile so that the entire surface is flooded, and that the plastic rounds out at all edges.

Coating Edges

Mix plastic as before with a related color, and setting the tile end up in a vise, feed the mixture along the edge. It will spread evenly. Obviously, only one edge may be coated at a time. If the mixture is over-catalyzed; i.e., if approximately a half again as much hardener is added to the batch, it will harden in less than twenty minutes. This procedure is safe on a narrow edge where the small dimension of the coating presents no overheating problem. Furthermore, if a group are at work, many edges may be set up and done at one time. Should edges turn out other than smooth, they may be filed, sanded, and buffed to the desired finish. Edge batches of plastic mixture, being necessarily small, follow the ratios of ingredients given in the first formula.

Project 2. Making a Coffeepot Tile. See Figure 1.

This project is a composition of nine small colored tiles glued to a plywood base

Fig. 3. Flow-coating a tile

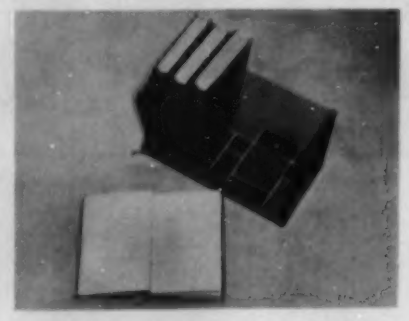


Fig. 4. Desk-size book stall

piece measuring ¼ by 4 3/16 by 4 3/16 in.

1. For the small tiles, cut a plywood strip ¼ by 2 1/16 by 12 in.
2. Square an end in a miterbox saw or a power saw.
3. Cut 6 pieces 1 in. wide, and 1 piece 2 1/16 in. wide.
4. Cut 2 of the 6 pieces in half, making 4 pieces 1 by 1 in. Use backsaw.
5. Sand off burrs, and set on a sheet of glass, ready for coating.

Design Is Arrangement

Apply the *domino* theory. Have students set the pieces thus cut into pleasing but asymmetrical order on the base piece. This is a simple lesson. They will probably and naturally place the large square in the center of the design, and they will note that balance is obtained by distributing sizes and shapes in approximate equilibrium on each side of an imagined center line. The teacher should show that symmetry is a sort of monotony because the restfulness which the eye seeks is fixed; in asymmetrical balance, the rest is a matter to be looked for, and the resulting challenge renders the design dynamic and of greater interest.

Design Is Arrangement of Color

Design is an exercise of the feeling in the selection and arrangement of color as well as of surface pattern. Our problem now is to produce a pleasing color pattern, not of one color, but of a harmony of colors and shades.

1. Return to the mixing of plastic as already given, adding a dab of blue, and mix. Coat the four largest tiles with this mixture. See that each tile is flooded to about the same depth of plastic.

2. Mix into the remaining plastic a dab of green, and apply to three of the remaining pieces.

3. Mix into what is left of the plastic a trace of white, and apply to the last two tiles. Allow all tiles to set.

Have the student place his colored tiles in asymmetrical balance on the baseboard, so that colors balance in the same way that shapes were made to balance in the first exercise.

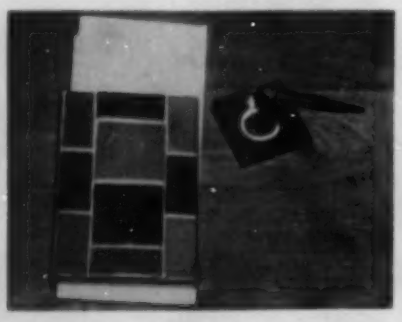


Fig. 5. Letter file keeps letters in order

Completing the Project

1. Spread white cabinet glue or mixed liquid plastic over the baseboard and set tiles as arranged above. Space them uniformly. When the glue or plastic has set, sand the edges, and fill the edge spaces and cracks with wood putty.

2. Coat edges with the colored plastic mixture explained in Project 1, using a greater proportion of Castosil. Do one edge at a time. Fill the edges high.

3. Cut four ¼-in. lengths of ⅓-in dowel, and cement them with plastic to the underside of the tile as feet. The bottom may then be coated with colored plastic.

4. Fill the joints between the tiles with a mixture of plastic and china clay or whiting. Work it into all the joints, and wipe off the surplus with a half dozen sheets of paper toweling, folded flat. Then wipe the surface with a cloth dampened in Castolite thinner.

Project 3. Making a Letter File. See Figure 5.

This may be made any size, of course, but our project is a small one. Cut two pieces of plywood ¼ by 4 3/16 by 7¼ in., one piece for the bottom and one for the cover. For the small tiles to be applied to the cover, cut plywood stock ¼ by 2 1/16 by 20 in. Out of the latter, make 15 small tiles as follows: 2 pieces 2 1/16 in. long, and 10 pieces 1 in. long. Cut 3 pieces of the 10 in half, making 6 pieces 1 by 1 in. Use a backsaw to do this.

The pieces are then arranged into asymmetrical pattern as above, and coated in the same manner as explained for Project 2. Proper procedure will require that the dominant pieces are framed by the lesser, as shown in the illustration, but the lesser should be distributed in a balanced way, both as to color and to shape. These are cemented to the cover.

With a temporary separating device such as layers of cardboard, hold the bottom and tiled top in a vise, separated ⅛ in. Glue to the back a strip of thin leather for hinge, and coat remaining edges as explained in Project 1. Oil wood surfaces, and fill joints as before.

Project 4. Making a Bookstall. See Figure 4.

This project employs a similar tile ar-

rangement as in Project 3, but as the back is open to view, it must be selected for wood grain. This back measures ¼ by 4 3/16 by 8½ in. The small tile stock is ¼ by 2 1/16 by 24 in. out of which 17 tiles are cut as follows: 2 pieces 2 1/16 in. long, and 14 pieces 1 in. long. Of the latter, 2 pieces are cut in half. Color coating and arrangement follow the procedures given in Project 2. The top edge is coated.

The stall is set up with wood sides, each measuring ¼ by 4 3/16 by 4 3/16 in. These are cut in simple contemporary pattern as shown, coated blue on each face, and blue-green on all visible edges. Irregularities on edges are filed, sanded, and buffed. The surfaces to be joined with the backboard are roughened with drill and file to be better gripped by cement, and joints are cemented with plastic mixture.

This would complete the bookstall but for need of weight, which can as well be furnished by the books themselves. Therefore, a sheet of Fiberglas filled plastic, finished size 3/64 by 4 3/16 by 9 in., is cemented to the underside of the stall. The sheet is made by coating 2 thicknesses of Fiberglas cloth cut oversize and lying on a sheet of glass, with plastic mixture. When set, remove with a sharp chisel and trim to size with shears.

Project 5. Making a Tile Tray.

This glass tray is a more ambitious version of the second project, if there are upper I.Q. boys in the class who want more for their effort. The base plywood piece measures ¼ by 6⅜ by 8½ in., figuring 1/16-in. spaces between each tile. The tile stock measures ¼ by 2 1/16 by 30 in., to be cut into 1 piece 2 1/16 in. long, and 22 pieces 1 in. long. Of the latter, 4 are then cut in half with a backsaw. The pieces are sanded clean of burrs, and coated as in Project 2, using again, the three or four harmonized colors with one the dominant. If every project in the shop is in the given range, there will be less difficulty at the start, and the result will be excellent for all. Have the students arrange their design as before, glue the tiles, and sand the edges.

Give students creative opportunity in making the edge frame of wood. Our suggestion may be varied from the simple vertical frame shown to one that slants outward at any degree in a selection of widths. The corners are lapped or mitered, according to the class level, and the four components are cemented to the tile assembly with Castoglas mix.

Three-quarter inch lengths of ⅛-in. brass tubing are set ¾ in. from the corners into drilled sockets on the bottom side for legs. Tile joints are filled as before, and wood is oiled.

Project 6. Making a Hot Dish Tile.

This is a project with endless creative potentialities, and the same principle may be applied to all large tiles and a few small ones in projects 2, 3, 4, and 5. The large tile in Project 5, for example, has a whirl design on its face, made by winding 20-ga. soft brass wire around nails driven into the design on a board. The wire is started by inserting the first end into a drilled hole. It is wound to come out flat in the end. When trimmed, it is merely laid on the wood tile blank, and colored plastic is poured over it. If after casting, some of the wire is under the surface, it may be scraped and buffed to the surface.

Project 6 is a full, conventional leaf shape 4½ by 8½ in. However, any contemporary shape may be used with success. See Figure 1.

Cut and polish long lengths of both 1/16 and 7/64 in. brass wire, cut into proper lengths, and bend the heavy wire to outline the shape as well as make the stem in the center of the surface. Then bend the intermediate veins. These should all lie flat to the baseboard. All curves must be as smooth and void of flats and kinks as the flight of a jet plane. The eye is quick to detect an off curve. Let the students divide their spaces interestingly, balancing areas on one side with those on the other, and when all is arranged, mix colored plastic and pour and spread it over the face of the tile so that its upper surface lies just below the level of the small wire. The wires, in other words, should extend slightly above the surface of the plastic.

This ends the present experiment. It is hoped that many of the thousands of excellent teachers in our school shops will try these simple pieces. If supplies are furnished the students, they will follow the foregoing directions and complete the experiments with little help from the teacher, profiting greatly from having a chemical experience and having worked with a truly thrilling new industrial material.

VISUAL AID FOR MULTIVIEW PROJECTION

FLETCHER M. HAIGHT
Instructor, University of California
Santa Barbara College
Santa Barbara, Calif.

The visual aid shown in the accompanying photographs was designed and built to demonstrate the principles of multiview drawing. In this type of drawing we describe a solid (or three dimensional object) by projecting the front view onto the vertical projection plane, the top view onto the horizontal projection plane, and the right side view upon the profile projection plane or upon the corresponding three planes of a transparent cube. This gives us an accurate drawing of the solid object to full or fractional size in width, height, and depth as shown in Figure 1.

The construction of this particular visual aid enables us to revolve the above-mentioned three planes of the cube into one continuous plane. This is the concluding step in the mechanics of multiview projection demonstrated in Figure 2.

The transparent plastic cube shown here is 18 in. on a side. The wooden base forms the sixth side of the cube and is recessed to receive the plastic. Rigidity of construction is increased thereby.

Edges of the cube are hinged together as pictured. Screws were used to fasten the hinges to the plastic. The horizontal projection plane, containing the plane view and the profile projection plane, containing the right side view are hinged to the vertical projection plane, containing the front view. The three are one assembly, enabling the person demonstrating the equipment to lift these three faces of the cube and dis-

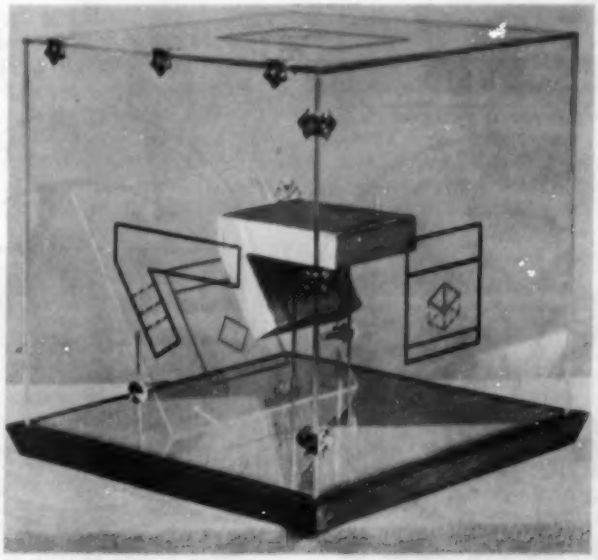
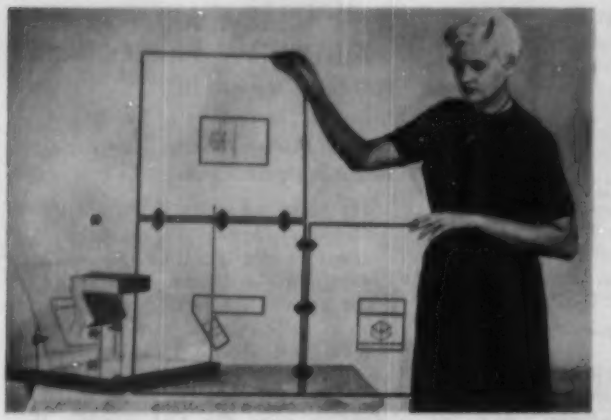
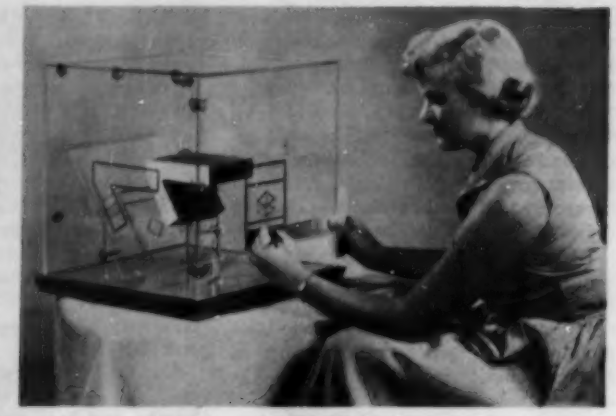


Fig. 1. The visual aid was designed to demonstrate the principles of multiview drawing





Figs. 2 and 3. Demonstrating the multiview projection procedure

— Photographs, Charles J. Perez

play the completed three-view drawing as shown in Figure 2.

There are two sets of rods and clamps that are used to hold auxiliary planes in position and enable the demonstrator to draw and display both first and second auxiliary views. The perforated aluminum base plate makes it possible to change the position of the object being drawn and also the positions of the auxiliary planes.

Wax pencils were used to draw on the plastic. Freehand sketches or mechanical drawing techniques may be used to complete the views as shown in Figure 3.

HAND CARVED SILHOUETTES ON WOOD NOVELTIES

DICK HUTCHINSON
San Gabriel, Calif.

This article presents an interesting method of decorating all sorts of boxes. It is so simple that anyone, regardless of whether or not they have talent, can have a lot of fun making some beautiful pieces, either for personal use, or for gifts.

Since the great interest in the do-it-yourself movement got under way, about everyone owns some sort of carving equipment, along with their other workshop tools.

We are not only going to show how simple it is to surface carve silhouettes on wood novelties, but we will also show how a great variety of sizes and shapes of boxes may be made by cutting the body of the box from a solid wood block.

We will start with the powder box. White (sugar) pine provides the best material for most of this type of art, and it is so easy to work. Scribe the circles on a piece of 1⅜-in. white pine, as shown in Figure 1, and saw out on the jig saw. See Figure 2. Saw outside the lines so that you will have stock enough to allow for sanding. Sand inside and out. Then cut the

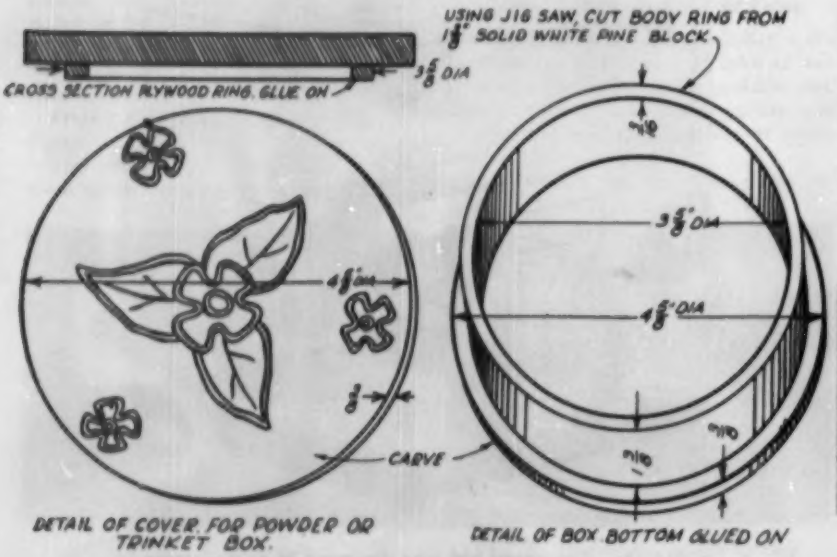

USING J16 SAW, CUT BODY RING FROM 1⅜" SOLID WHITE PINE BLOCK
CROSS SECTION PLYWOOD RING. GLUE ON
3⅝" DIA
4⅝" DIA
CARVE
DETAIL OF COVER FOR POWDER OR TRINKET BOX.
3⅝" DIA
4⅝" DIA
DETAIL OF BOX BOTTOM GLUED ON

Fig. 1. Powder or trinket box

Fig. 2. Sawing center out of 1⅜-in. white pine block to form the powder box

two disks for the top and bottom, out of ⅛-in. pine. Glue the body to the base and clamp until dry.

Trace the design on the disk that will be used for the cover. Then carve out, as shown. The carving may be done with hand carving tools, such as are shown in Figure 3, or with cutters mounted in a flexible shaft, or with a motor-in-hand tool as shown in Figure 4. Carve out the design in relief, as shown in Figure 5. By using the finished box shown as a guide, it will be a simple matter to judge the depth of the

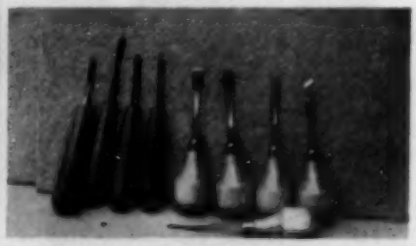


Fig. 3. A set of linoleum carving, and a set of wood carving hand tools

Fig. 4. Using the motor-in-hand tool for carving the design on the cover of the powder box

cuts — about 1/16 in. Beautiful results may be obtained in this way. Carve around the rim of the base of the box, but leave the body, or drum plain.

Cut a birch plywood ring, as indicated in Figure 1, and glue to the underside of

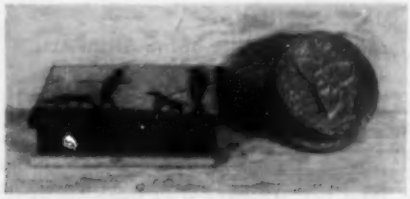


Fig. 5. The finished silhouette jewel case, and the carved powder box

the cover. This is to fit down inside the box.

Any finish desired may be used. The one shown in Figure 5 was painted on the outside with a dark brown oil paint. This was then wiped dry with a soft cloth. Enough of the pigment remained in the undercuts

Fig. 7. Sawing the center out of the solid pine block to form the box for the jewel case

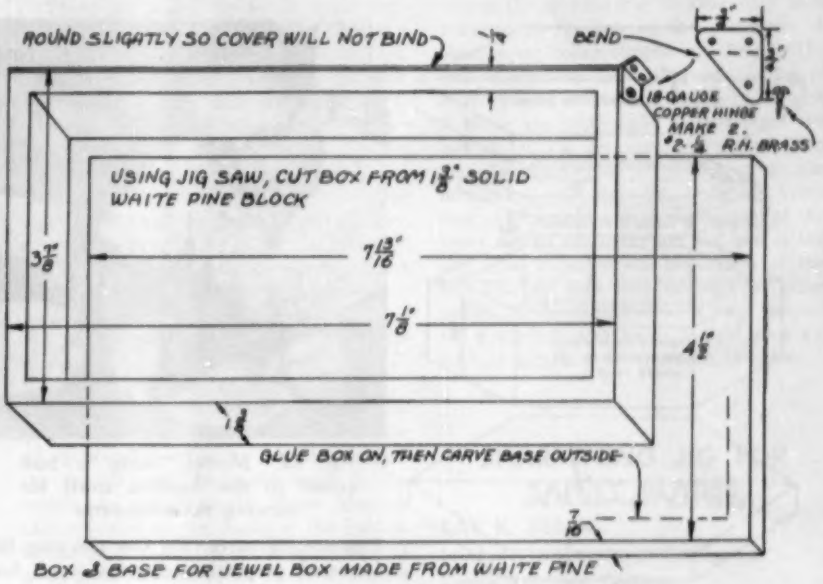

ROUND SLIGHTLY SO COVER WILL NOT BIND
BEND
18-GAUGE COPPER HINGE MAKE 2.
2-¾ R.H. BRASS
USING JIG SAW, CUT BOX FROM 1⅜" SOLID WHITE PINE BLOCK
3⅞"
7 13/16"
7⅛"
4½"
GLUE BOX ON, THEN CARVE BASE OUTSIDE
7/16
BOX & BASE FOR JEWEL BOX MADE FROM WHITE PINE

Fig. 6. The jewel box

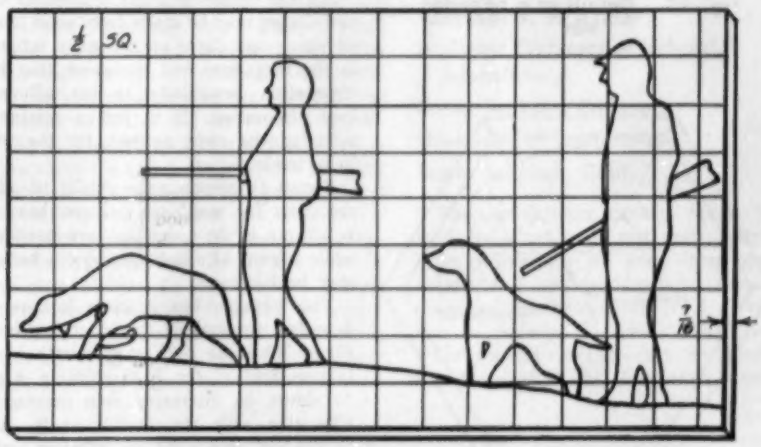


Fig. 8. Detail of jewel box cover with the silhouette outlined

to make the carving stand out. Two coats of white shellac were then applied on the inside and outside. Details for making the box for the jewel case are shown in Figure 6. The piece may be squared on the bench saw. Figure 7 shows how the inside of the box is cut out on the jig saw. Sand the

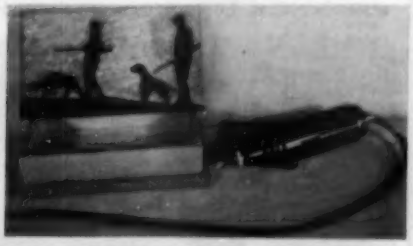


Fig. 9. Carved (silhouette) cover setting on top of assembled box, for the jewel case. Motor-in-hand tool with which carving was done is shown at right

box inside and out, to a smooth finish. Then glue to the base and clamp to dry.

The cover for the box is cut from 7/16-in. white pine. Then, through the use of carbon paper, the outline of the silhouette is traced on. The carving may be done with hand carving chisels if desired, or with the flexible shaft. Carve the outline, then carve to a depth of about 1/16 in. all over the outside. Round off the corners. Also carve the base outside the box. See Figure 8 for outline of silhouette, and Figure 9 shows the completed silhouette.

Make and apply the two copper hinges, as shown in Figure 6. Then thin a bit of dark brown paint in turpentine, and brush over the base and cover, and wipe off. This done, using a small camel's hair brush, paint the silhouette over with a coat of flat black enameloid, and paint the body of the box inside and out with the enameloid. The finished case is shown in Figure 5. This box makes an excellent jewel case, or it may be used to hold 100

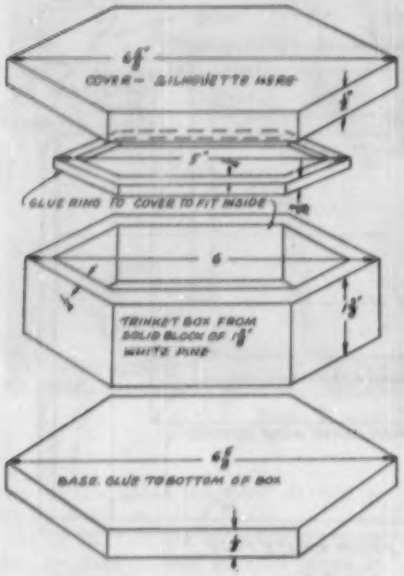

COVER — SILHOUETTE HERE
GLUE RING TO COVER TO FIT INSIDE
TRINKET BOX FROM SOLID BLOCK OF WHITE PINE
BASE. GLUE TO BOTTOM OF BOX

Fig. 10. Details of a hexagon box

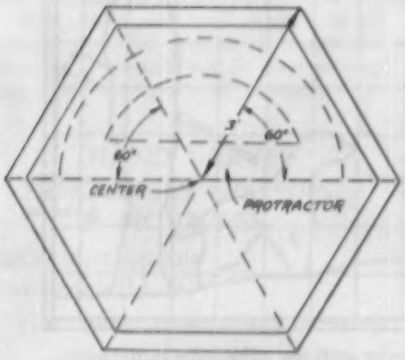


Fig. 11. Protractor method of laying out hexagon

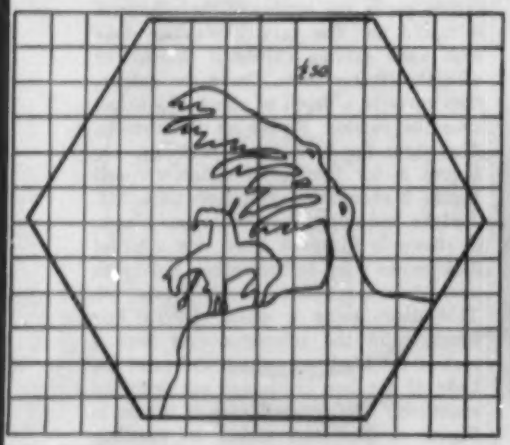


Fig. 12

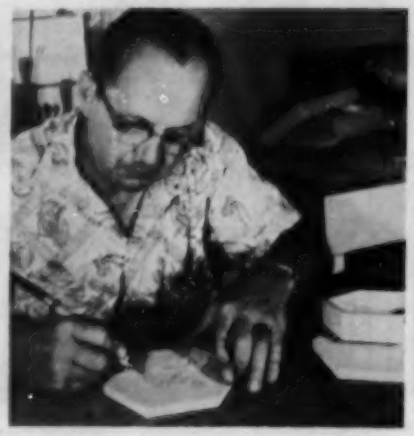


Fig. 13. Model, using a ball cutter in the flexible shaft for carving the silhouette

king-size cigarettes. The size also may be increased proportionately, and used for gloves.

A great variety of boxes in assorted sizes and shapes may be made from solid blocks of wood, and there are so many subjects, in the magazines and elsewhere, that lend themselves beautifully to the silhouette type decoration. It is just a matter of selecting the right subject for the piece being made.

Figure 10 presents the details of all of the parts for making a hexagon box, and is laid out in the order they are assembled, while Figure 11 illustrates how a hexagon may be laid out.

This hexagon box is made just as was described for making the other two boxes. Figure 12 is an outline silhouette of the famous *End of the Trail* painting. Figure 13 shows an interested man carving the silhouette with the flexible shaft. After assembling, thin a bit of cadmium artist's oil paint in turpentine and wash over the outside of the box cover. After this is dry, paint on the silhouette with the flat black enameloid and, in this case, we painted the body of the box with bright red (vermilion) enamel. The orange wash gives the effect of a sunset, and it is beautiful. Our finished piece is shown in Figure 14.

The craftsman who uses the flexible shaft, or the motor-in-hand tool, should remember that burr cutters of assorted types and sizes are available at all tool supply houses. Too, it will be well to call on your dentist, who will be happy to give you a goodly supply of dental burrs that have served their purpose for his work, but are still excellent for this type of carving.

Outline the subject with the cutters. Then carve out as we have shown, to a depth of about $\frac{1}{16}$ in., and sand each carved piece lightly to remove ragged edges.

For boxes that are made for jewelry, etc., it will be well to purchase a small quantity of nylon flocking of the color desired. Black is best. Paint the inside of the box with a coat of heavy enamel. Sift on a generous coating of the flocking, and press down evenly with the fingers. When dry, dust off with a soft brush. The results will be an even felt-like lining. Flocking is now available at most art stores.

Fig. 14. The finished hexagon box with silhouette of "The End of the Trail"

LIGHTPROOF AIR VENTILATOR FOR THE DARKROOM

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Many school shops are engaged in expanding their areas of work. In James Smart School, in Fort Wayne,[1] it was the case of expanding our areas of work. Adding photography to the curriculum required the building of a darkroom. The small size of this darkroom made air vent-

[1]R. Paul Lightle, supervising instructor of industrial arts, James Smart School, Fort Wayne, Ind.

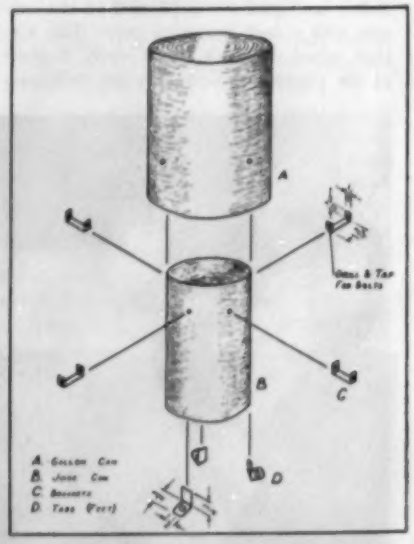

Fig. 1. Exploded view of lightproof air vent for photography darkroom showing the brackets, the gallon can, the juice can, and the tabs

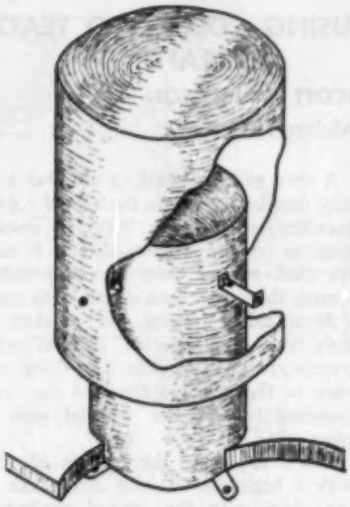

Fig. 2. Phantom view of assembled lightproof air vent installed

ing a major problem. The big problem was to let the air flow out without letting in any light. The use of baffle plates would be necessary to solve this problem.

The requirements for building the air vent were as follows: first, it must be low in cost, but still meet the requirements of the job it is to perform. Second, the air vent must let the air flow as freely as possible, yet stop all light from passing through. Third, the air vent must be easy to construct. Fourth, the air vent must be easily installed.

The air vent that was developed met all of these requirements. It is believed that this air vent will not only serve the purpose for which it was originally designed, but will also, with certain adaptations, serve many different purposes as well. The fact that it is easily constructed, is easily installed, is inexpensive, and works effectively makes this air vent a good, practical idea.

The materials for constructing the air vent shown in Figure 1 are as follows:

1. Two clean tin cans
   - *a*) One tall fruit-juice can with both ends cut out
   - *b*) One No. 10 — gallon can — with one end cut out
2. Four pieces of strip steel, $\frac{3}{16}$ by $\frac{1}{4}$ by $2\frac{3}{16}$ in.
3. A pint of flat black paint
   - *a*) If flat black paint is not available, one may use china clay mixed into a pint of black enamel to make it flat.
4. Three or four sheet-metal fasteners or pieces of sheet metal shaped to personal requirements — No. 20 gauge by ½ by 1½ in. These are used to attach this vent to the top of the photo darkroom.
5. Three or four wood screws, No. 4 by 1 in. long, and four bolts ¼ in. long, ½ in. diam., No. 20 — N.C.

There are many places to begin construction of the air vent. One can start with the holes to be drilled in the cans. The holes are drilled 5½ in. up from the bottom of the juice can. See *B*, Figure 1. These four holes are drilled directly opposite each other. There are four holes drilled 2½ in. up from the bottom of the gallon can. See *A*, Figure 1. These four holes should also be drilled directly opposite each other.

The metal brackets are bent into a square cornered *U*. Then drill and tap a hole in each leg of the *U*, for ¼ in. 20 — N.C. machine bolt. These holes should be directly across from each other. See *C*, Figure 1.

The tabs, or legs, are made next. The hole drilled in one end should be the size of the wood screw to be used for mounting the air vent. Bend the metal in the middle, to a right angle. These tabs are then soldered to the inside of the bottom of the juice can with the holes being out away from the can, as shown at *D*, Figure 1.

The next step is to paint the cans and brackets. After they have dried, the tall juice can is inserted through the hole that has been cut from inside the darkroom. When the wood screws are inserted, the bottom section of the air vent is secured. The strip metal brackets are then bolted in place and the gallon can is slipped over the metal brackets. After the gallon can is bolted to the brackets, the air vent is complete. See Figure 2. The surface immediately underneath the air vent may be painted flat black to stop the light if there is too much reflection from this surface.

There are other methods of constructing this air vent. The method to fit the need will probably be of most value. For instance, the air vent may be assembled, then fastened to the top of the darkroom. A sheet-metal collar slipped up through the hole would stop the light from coming in from beneath the vent. Putty may be used if there are small light leaks around the bottom of the air vent. An electric fan may be adapted to fit within or at the bottom of the air vent. Two air vents may also be used, one at the bottom of the lower side of the darkroom and one at the top. This improves the circulation of the air. This air vent may be used on other rooms. It also would make a good project for a student who needs a lightproof air vent at home for some reason or other.

SHARPENING JIG FOR SAFETY BLADES

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Santa Barbara College
and
WILLIAM F. HOLTROP
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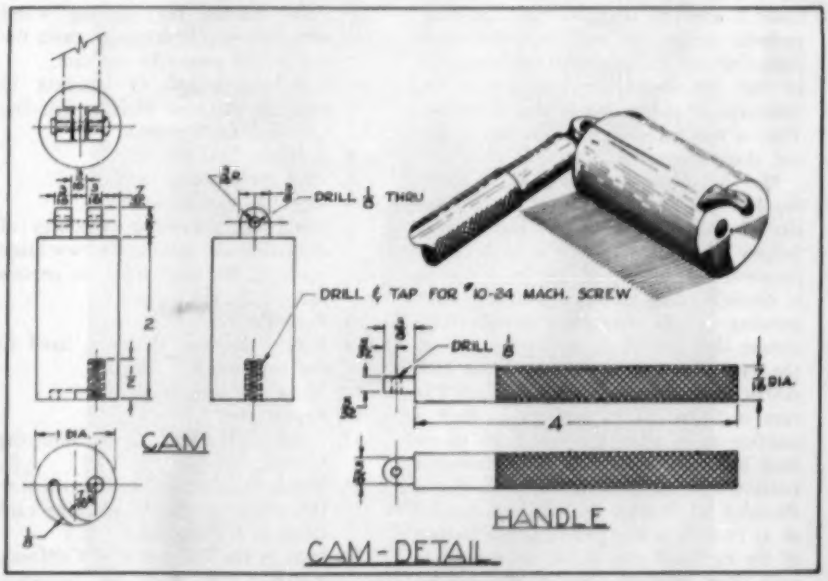
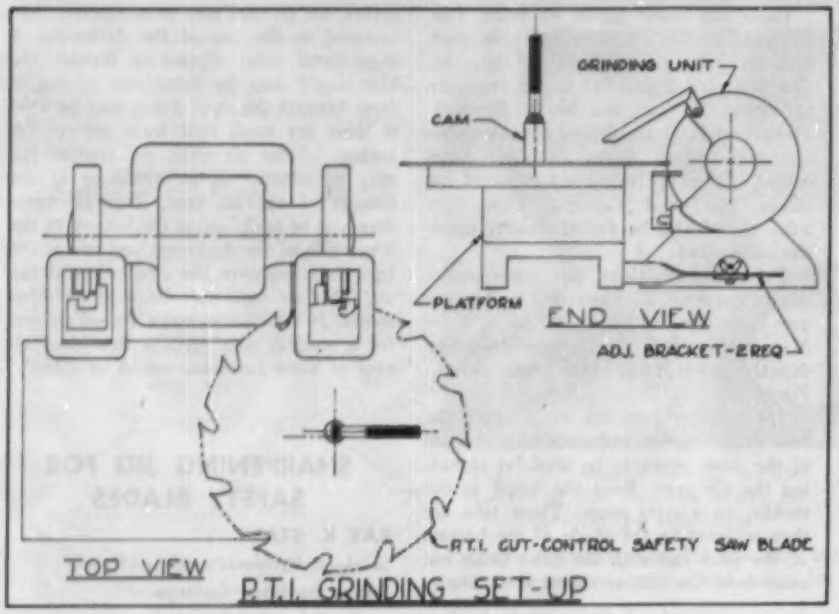
The conventional circular ripsaw blade with its large teeth and deep gullets is often responsible for some very serious accidents in the woodworking shop. To overcome this hazard the P.T.I. Corporation of America in August, 1950, introduced the cut-control safety saw blade to the American public eliminating many of



Sharpening jig cam detail



Set-up for grinding jig

the dangers inherent in other types of saw blades. It contains only from eight to twelve teeth, depending upon the diameter of the blade, instead of the customary thirty or more teeth of the conventional blade. Each tooth stands only .020 of an inch above the noncutting periphery which forms the rest of the blade. Two of the main advantages claimed by the producers of this blade are the elimination of *kickbacks* and the reduced danger of severe cuts. These are possible because the noncutting periphery between the teeth acts as a stop and prevents the teeth from making a cut over .020 in. Like any other blade it must be correctly maintained by periodic sharpening and since the tooth design of this blade is different from that of the conventional ripsaw tooth, the technique of sharpening is also dissimilar. Thus it was necessary to work out a special sharpening setup.

The following sharpening jig recently developed in the woodshop at the University of California is doing a highly satisfactory job of sharpening the teeth of the cut-control safety blade. Its basic part is a specially designed cam which permits grinding of the noncutting periphery to restore the .020 of an inch projection to the teeth. It also keeps the periphery concentric with the arbor hole in the saw. The cam is bolted to a platform in such a position as to allow the saw blade to extend beyond the platform and come into contact with the grinding wheel. A stop is threaded up through the platform located so as to slide in the groove at the bottom of the cam and stop at the same position each time. Brackets allow adjustment between the positions of the grinding unit and the platform. The grinding wheel is dressed to a curved edge similar to the curve required behind each cutting tooth of the saw blade, thus completing the setup. Because of the eccentric action of the cam it is not necessary to remove the blade when the saw teeth rotate past the grinding wheel.

Procedure in Using Jig

To use the specially designed cam in the grinding of a P.T.I. blade proceed as follows:

1. Slide the saw blade over the cam.
2. Rotate the cam so that the saw blade touches the grinding wheel when the stop is in contact with the end of the groove in the cam.
3. Lock the adjustable brackets to keep the platform and the grinding unit in a fixed position.
4. Back the cam off.
5. Start the grinding motor.
6. Move the cam forward.
7. Grind the noncutting periphery of the saw blade, rotating the saw blade by hand. Be careful not to remove part of the cutting teeth.
8. Back the cam off.
9. Rotate the saw blade by hand to the next tooth.
10. Move the cam forward.
11. Repeat step 7.
12. Grind all the teeth in the foregoing manner.
13. Touch the front of each tooth with the gumming wheel and bring each tooth to a sharp point.

Students in the University of California have followed the foregoing procedure with excellent results.

USING COLORS TO TEACH DRAFTING

SCOTT WILLIAMSON
Wichita Falls, Tex.

A very effective teaching aid that some may care to try out is the use of colored drawings made on the backs of obsolete maps or on new window shades. If maps are used, remove them from the rollers, reverse them, and then attach them again.

As an aid in drawing, use one chart for each type of illustration, such as orthographic, oblique, or isometric. Color each view in the orthographic, and the corresponding face in the pictorial with the same color.

When discussing the relation of views with a beginning drafting class, take out the chart with the desired ready-made views in orthographic. Then to illustrate these views still better, bring out one of the charts showing the views presented pictorially. In many cases the student will make his own discovery of the relation of views without further comment from the instructor or at least with very little explanation.

To utilize the charts fully, several drawings are made on each chart. When starting a class in orthographic bring out the chart with the pictorial representation and have the students make the orthographic views. When starting in pictorial drawing, use the chart on orthographic drawing, and have the students make the pictorial presentations. This has been a very effective method in the eighth grade exploratory class, the value of which is shown by the start that is made when they enter the ninth grade drawing class.

The charts may be placed in a compartment above the chalk board, where they are always out of the way when not in use.

As an aid in the drafting room, all those anticipated illustrations may be made in advance. The use of color makes for a more pleasing and effective chart.

The combination of charts and illustrations that could be made are innumerable and their value is too great to pass up. The charts are durable and are worth the time used in making them.

If you have never used color in illustrating drawings, then try the following experiment on your beginning drawing class. Show the following orthographic and pictorials without color. Then color the drawings as indicated and watch the results. Preserve the drawings in your magazine for future reference. Have your students make an orthographic, oblique, and isometric of a simple object and color as indicated in the chart. Note the grasp of the relation of views and the interest shown in the use of color.

In our exploratory classes we have an object drawn in orthographic, then in

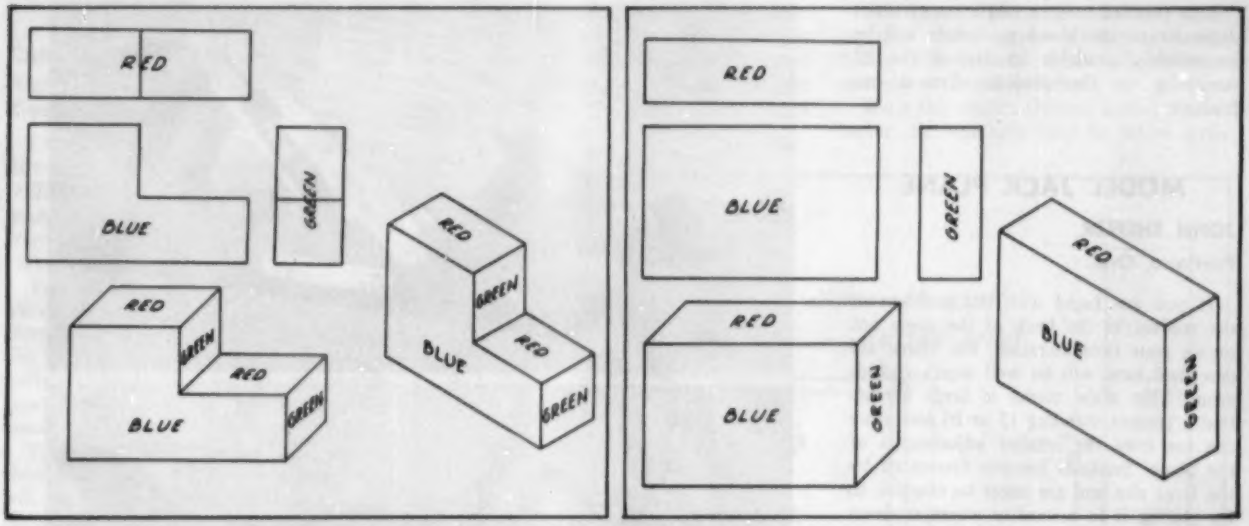


Chart showing the use of color as an aid in drawing

oblique, then in isometric. We have the views in orthographic and the corresponding faces in the pictorials made a like color. Then we have the orthographic dimensioned. Using this starting procedure we find that the student has fixed in his mind the relation of views. At this point the student is ready for a more advanced problem. Since our exploratory period is only six weeks we have to make the most of each day. By the use of one chart on dimensioning and one each on orthographic and oblique and isometric, we are able to cover a considerable area.

AN OIL STAND

CARL H. HUBACHEK
High School
Branford, Conn.

The use of oil for hardening purposes in the shop is usually discouraging due to the problems caused by the oil being spilled and spread around on the floor and equipment in the hardening area.

Since we started using the oil stand shown in the accompanying illustration we have had a minimum of oil spilled.

The container is a five gallon pail such as is used for floor wax and paint. The stand was made of short lengths of pine. A set of good quality casters was put on the bottom so the stand can be easily moved to and from the furnace. The top of the stand is the same height as the tops of the benches in the shop, usually 30 in.

A basket made of ¼-in. hardware cloth is kept in the oil in order that pieces dropped into the oil may be readily retrieved. The bottom of this basket is lined with window screen to prevent small articles from dropping through the bottom.

To help cool the work quickly and evenly the basket is raised and lowered in the oil after the project has been dropped in.

When the work has cooled sufficiently the basket is raised, and the work is placed on the metal top of the stand and allowed to drain. Any remaining oil is then wiped off at the stand so a minimum of oil is dropped on the floor.

The box shown at the bottom of the stand is a good place to keep sawdust or some commercially prepared product to be used to soak up any oil that may be spilled.

When a project is being hardened it is a good idea not to remove it from the oil until it can be comfortably picked up with the fingers. In this way one is assured that the project has not been removed while it is still hot enough to begin the tempering process prematurely.

Oil stand

It is planned now to add a paper towel dispenser to the stand so towels will be immediately available to dry off the oil remaining on the project after it has drained.

MODEL JACK PLANE

JOHN SHEFLER
Portland, Ore.

If you are faced with the problem of the student in the back of the room not seeing your demonstration, the visual aid described here will be well worth considering. This scale model is large enough that a student standing 15 or 20 feet away can see even the smaller adjustments of the plane. Students become fascinated by the large size and are eager to examine it. By placing it in a locality where students can see it, handle, disassemble and assemble it, much information can be imparted to the eager student.

The importance of having students learn the parts of the plane cannot be overemphasized. This method of presenting the nomenclature to the students seems to work much better than a picture with labeled parts. Students see the direct relationship of one part to the other. They can handle the part and associate the name with the part.

The names of the parts, along with the technical information needed to have a good understanding of the plane is typed or lettered on paper and glued to the different parts of the model, then covered with a coat of shellac.

Effective painting of the model is a must. Bright colors make the aid appealing to the students. At the same time, contrasting colors should be used so that each part may be differentiated from the other. Vivid or *loud* colors should be used whenever possible.

Following is a list suggesting colors which may be used on the various parts.

Green: knob, plane iron cap lateral adjusting lever, *Y* adjustment wheel.

Yellow: lever cap, plane iron.

Red: *Y* adjustment arm, handle.

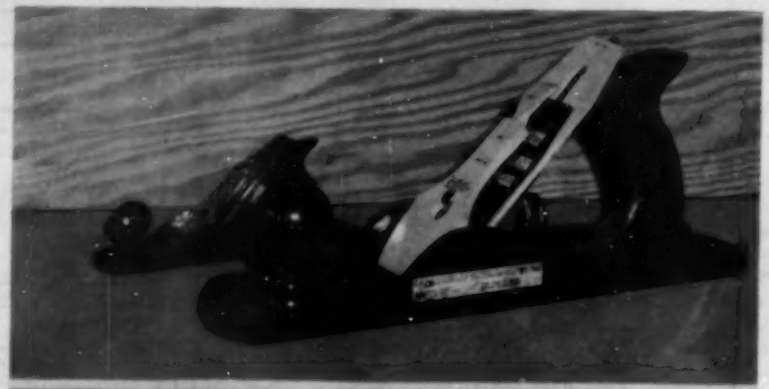
Blue: frog.

Black: bed.

The model is made to a scale of 2 in. equals 1 in. All the parts are made of soft pine with the exception of the *Y* adjustment and the *Y* adjustment wheel. These parts have been made of maple, as there is more wear on them. Threading of the holes for the lever cap screw, frog bolts, and the lug for the *Y* adjustment wheel is done in the same manner as cutting threads in or on metal.

The Try Square

When teaching the students to square up a board, the try square is just as important as the plane. The model shown in Figure 3 is used in giving demonstrations along with the plane model in Figures 1 and 2. This aid can be used to good advantage when showing the students how to read the try square. It can also be used for making scale drawings on the blackboard. Incidentally, for making the dimension lines, a tube of textile paint with a ball point does an excellent job.



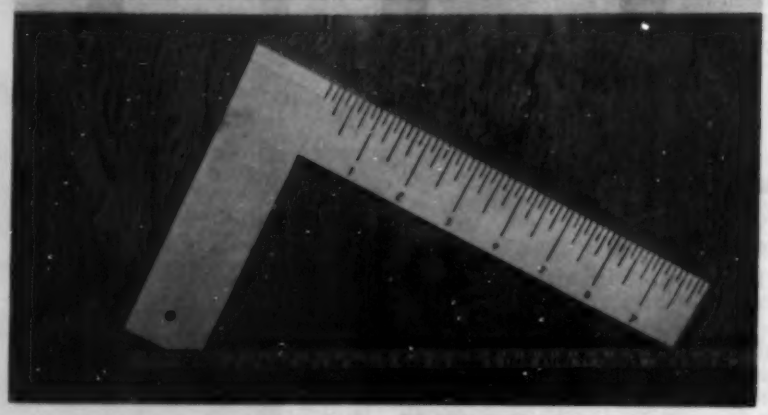


Fig. 1. A model jack plane; Fig. 2. different parts of the model; Fig. 3. the try square used in demonstrations with the plane model
— Seamahorn Studio, Colville, Wash.

Keeping up with the Jones'? If so, you had better rewire your home. Marketing experts predict an average of eight new electrical appliances will be bought by every home in the nation during the next five years — a grand total of 428,000,000 new products. — *Westinghouse News.*

Week-end crashes accounted for 13,980 killed and 678,000 hurt during 1954. — *The Travelers Insurance Companies, Hartford, Conn.*

A DUST COLLECTOR

CARL H. HUBACHEK
High School
Branford, Conn.

One continuous source of dust and dirt in a metal or general shop is the buffing machine. Without some sort of dust collecting arrangement the dust from the machine will cover nearly everything in the shop.

To cure this situation inexpensively obtain a used upright vacuum cleaner from a local dealer and convert it to the use described and shown here. Usually a used vacuum in reasonably good condition can be had for a small amount.

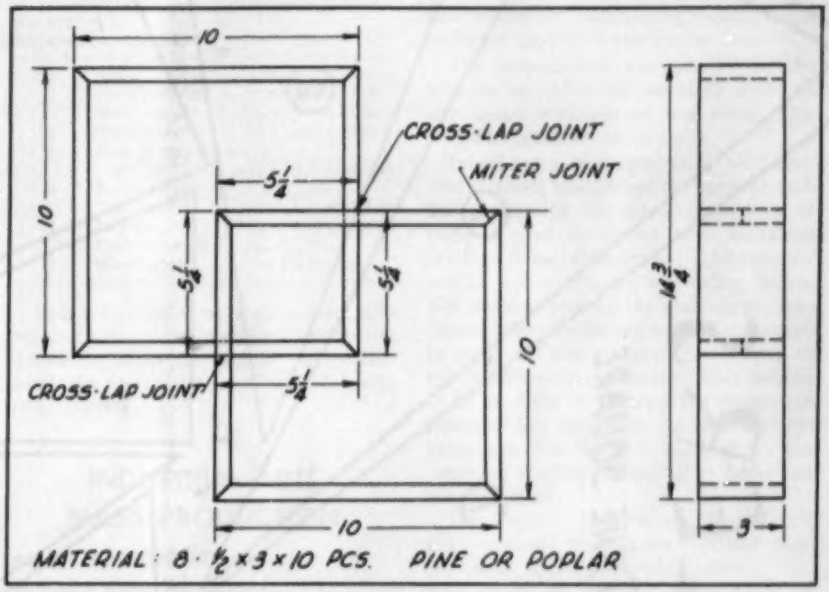
The broad nozzle, handle, and wheels should be taken off. Other adaptations will depend upon the vacuum cleaner obtained and the housing built around the buffing wheel. The buffer shown is a 3400 r.p.m. motor with an adapter on the shaft to take buffing wheels. The housing eventually built will of course have to be made to fit the particular buffer in use.

The best location for the opening for the vacuum is in a line with, behind, and slightly below the bottom of the wheel. If this arrangement is not possible the unit will work nearly as well on the side of the housing near its back as shown in accompanying illustration.

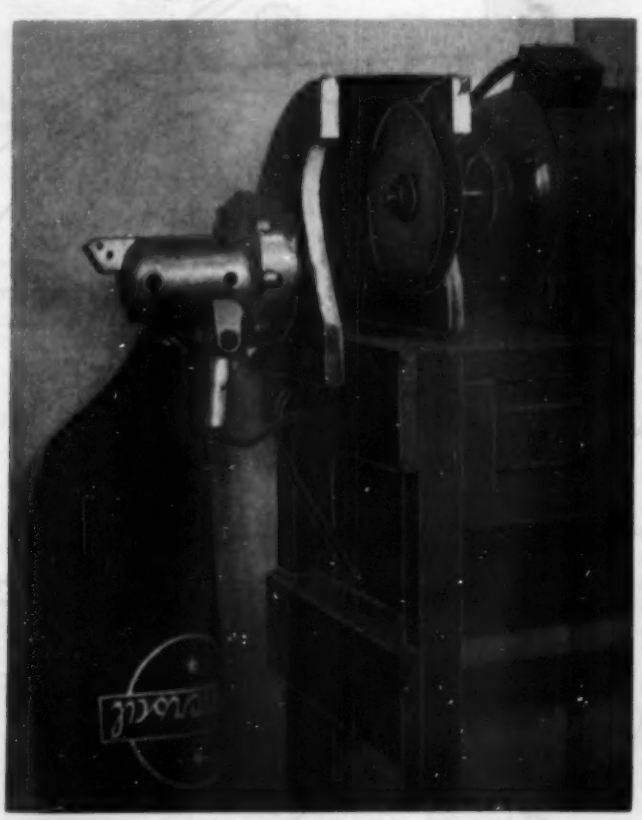
A piece of ¼-in. hardware cloth or some other screening should be fastened over the hole entering into the vacuum to keep fingers and small projects from entering into the vacuum fan.

Electrical connections should be made so that the vacuum cleaner and the buffer are turned on or off simultaneously with one switch.

With the vacum cleaner added to the buffer, the machine may be taken anywhere in the shop instead of just where dust will be the least offensive.



A shadow box by George V. Cardinale, woodworking instructor, Roosevelt Junior High School, Erie, Pa.



Dust collector attached to buffer

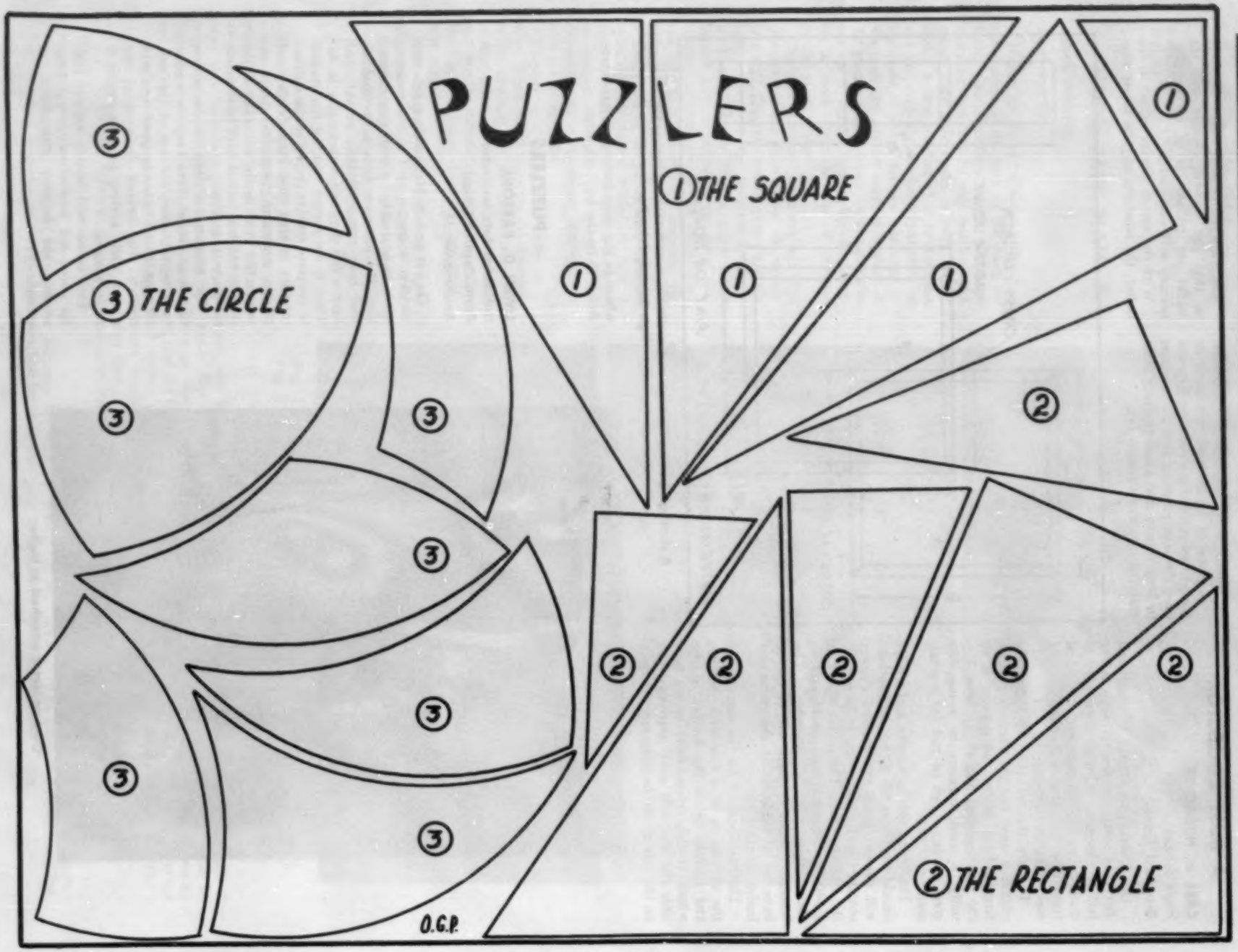
PUZZLERS

OWEN G. PARSONS
Industrial Arts Instructor
Perth Central School
Amsterdam, N. Y.

The last week in June usually means that vacation is coming, and it also means a headache is coming for most shop instructors. The instructor finds a few students who have completed their projects and have a few days left with nothing to do. There is not enough time for the student to complete another project so the instructor tries to keep them busy cleaning and painting equipment. Very often this is unsatisfactory and surely not fair to the student who has worked hard to complete his projects on time.

The puzzlers described in this article furnish an answer. They keep the student constructively busy and out of the way, allowing the instructor to spend time with projects. The interest displayed by the student while working on these puzzles is really amazing.

Each puzzle will keep a student busy for about one hour — tracing, jigsawing, sanding, and finishing with shellac or enamel.



Full-size patterns of the puzzlers

As for the stock, along about the end of May the instructor should place a container in the shop for all scraps of ¼-in. plywood, no matter how small. By the end of June there will be enough scrap saved for dozens of puzzles. Normally, this scrap could be used in no other way.

To make the puzzles, simply trace the full-sized outlines on the ¼-in. plywood, cut to shape, sand smooth, and finish with shellac or enamel.

Puzzle No. 1 — 4 pieces, makes a square. Solving time, 10 minutes.

Puzzle No. 2 — 6 pieces, makes a rectangle. Solving time, 15 minutes.

Puzzle No. 3 — 7 pieces, makes a circle. Solving time, 30 minutes.

COMBINATION MAGAZINE AND BOOKRACK

EDWARD GORAB
Mechanical Drafting Instructor
High School
Pompton Lakes, N. J.

The combination magazine and bookrack illustrated here is simple in design and construction so that a freshman in high school may construct it with satisfactory results.

Placed beside an armchair, this rack offers a convenient receptacle for your favorite magazines, books, and smokes. The trough at the bottom is large enough for Life magazine and will hold six or eight of your favorite periodicals. The next section will take care of about a dozen books. The top shelf can accommodate an ashtray, tobacco jar, etc. The handle at the top affords ease in moving the rack from one chair to another.

The type of wood and finish used may vary according to individual tastes.

BILL OF MATERIAL

No. Pcs. Required	*Material*	*Size*
2	Sides	¾ x 10 x 19 in.
1	Shelf, bottom	½ x 9½ x 15 in.
1	Shelf, middle	½ x 9 x 15 in.
1	Shelf, top	½ x 7½ x 15 in.
1	Back of magazine section	½ x 3 x 14½ in.
1	Back of book section	½ x 6 x 14½ in.
1	Handle	½ x 2½ x 14½ in.
	Finishing nails	4d
2	Wood screws	No. 5 x 1¼ f.h.

NOTE: Cut dado for shelves into sides before cutting sides to shape. Use the two screws to fasten the handle from underneath the top shelf to prevent the handle from turning.

INDUSTRIAL-ARTS MASS PRODUCTION

ALLEN S. CUTHBERT
Machine Shop Instructor
Washington High School
St. Paul, Minn.
and
ROBERT M. WORTHINGTON
Instructor, Industrial Education
University of Minnesota
Minneapolis, Minn.

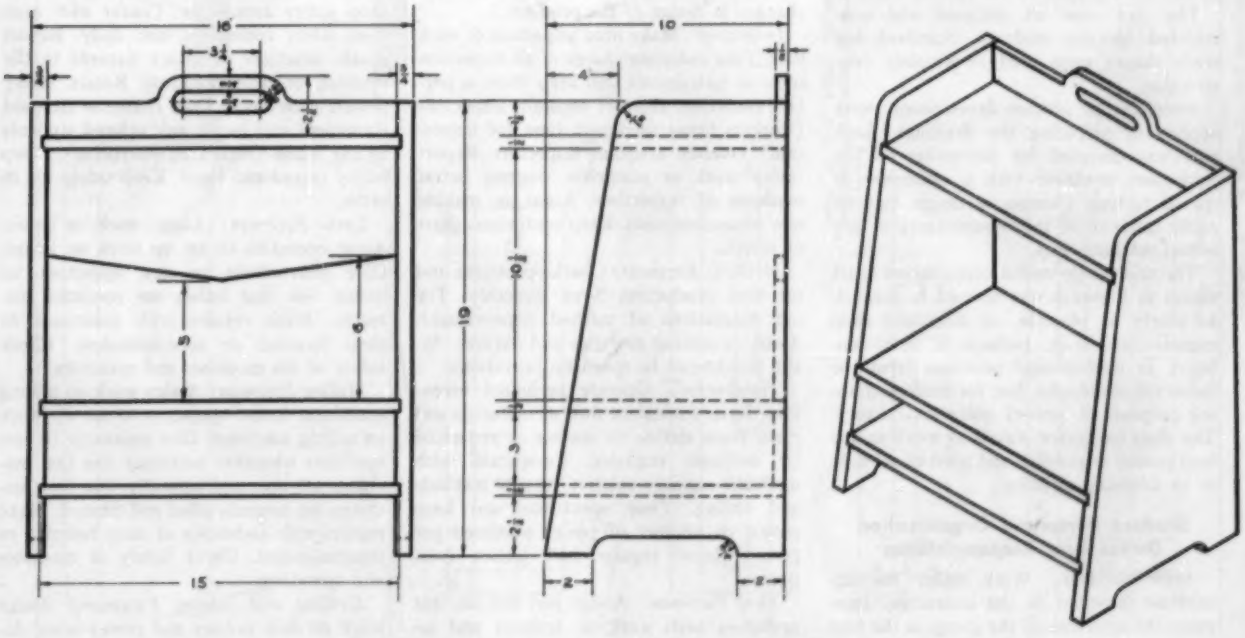
One of the important objectives in industrial arts is developing an interest in and an understanding of industry. It is an oft-neglected objective. This article describes a shop tested method for giving students experience with industrial production methods. While the method in this case relates to a machine-shop class, it can easily be applied to any similar shop.

The project used was selected by the students as one which would be useful in any home workshop or one which they would be proud to use as a gift.

Introductory discussion units on industrial methods familiarized the students with the concept of the interchangeability of parts. A visit to one or more industrial machine shops, although not absolutely essential, was a desirable motivating device. The students planned the plant visits, conducted follow-up discussions, and attempted to apply methods observed in industry to the industrial-arts situation. This proved to be of value in planning the production processes and setting up the personnel organization. See Figure 1 which shows the personnel diagram and listing of duties and responsibilities.

The project selected — a hand hack saw — was one which many boys had made previously as their individual project. This gave them an excellent opportunity to compare *mass production* and *custom* fabrication. Most of the students were amazed at the relative speed and ease of production using a simulated industrial method.

The class was a heterogeneous group typical of most industrial-arts shop classes. There was a wide range of intelligence and mechanical aptitude as well as different



A convenient magazine and bookrack combination

STUDENT PERSONNEL ORGANIZATION

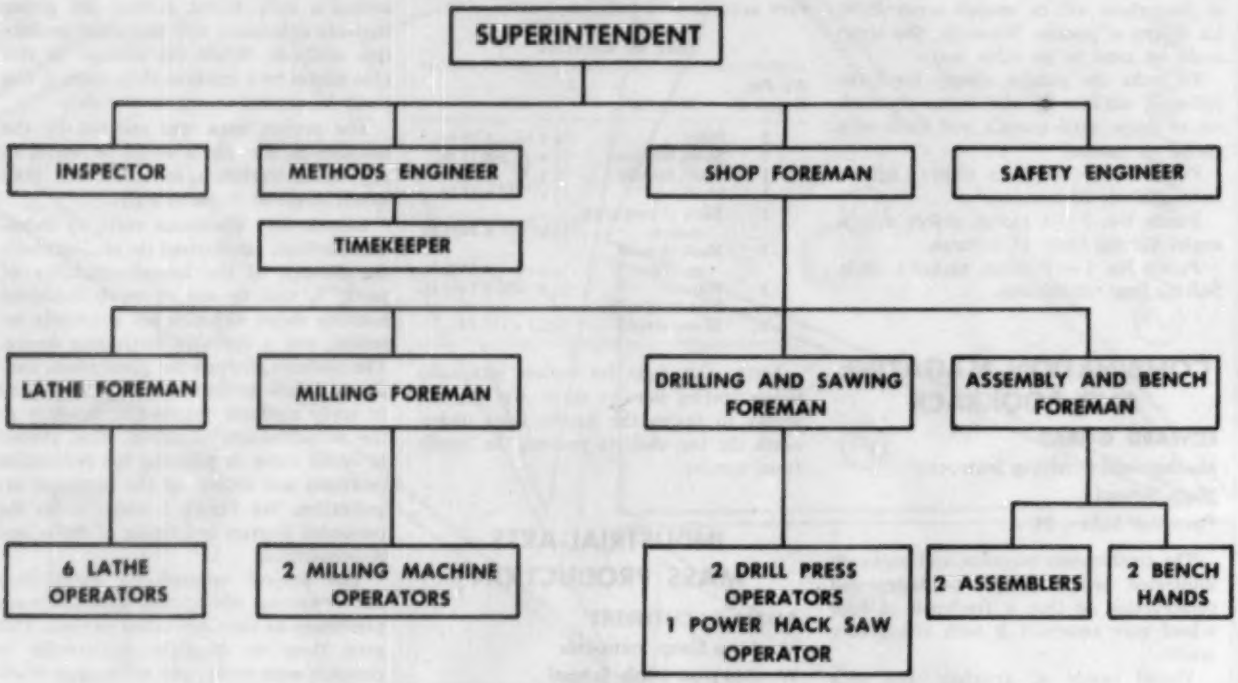


Fig. 1. Student personnel organization — duties and responsibilities

grade levels represented. Despite this divergence, each student achieved a feeling of accomplishment in contributing to the completed project. In many cases individual students would not have had the ability to make such a project by the *custom* method.

The jigs were all designed and constructed by the students. Standard bar stock shapes were used to simplify construction.

Principles of process development were applied in preparing the drawings. Each part was designed for processing on the equipment available with a minimum of special tooling. Changes in design may be easily made to fit the requirements of any school machine shop.

The student personnel organization chart shown in Figure 1 was devised to parallel, as nearly as possible, an industrial shop organization. It is, perhaps, a little top-heavy in management positions from the industrial standpoint, but for student training purposes it proved quite satisfactory. The shop instructor stayed as much in the background as possible and tried to act only in an advisory capacity.

Student Personnel Organization Duties and Responsibilities

Superintendent: Work under the immediate direction of the instructor. Integrate the activities of the group in the best manner to produce the best product in the shortest time. Guide the group so they will think for themselves. Direct when immediate supervision of a particular job is desirable (e.g., rearrangement of work stations). Administer matters of cost of materials, purchases, methods of discipline, changes in design of the product.

Inspector: Make final inspection of each part. Take complete charge of all inspection tools or instruments and keep them in perfect condition. Instruct assistant inspectors (workers being used part time for inspection). Oversee assistant inspectors. Report faulty work or materials. Suggest better methods of inspection. Assist in making new inspection tools. Keep continuous chart of rejects.

Methods Engineer: Check operations and see that production flows smoothly. Try out suggestions of method improvement. Assist in making new jigs and fixtures. Assist timekeeper to speed up operations.

Timekeeper: Operate perpetual inventory. Keep a constant flow of materials and parts from station to station as requested by methods engineer. Co-operate with methods engineer relative to new methods and timing. Time operations and keep record of number of pieces produced per period. Issue regular hall passes (rest pauses).

Shop Foreman: Assign jobs and see that operators keep working. Instruct and assist operators whenever necessary. Assist area foreman. Supervise during absence of superintendent. Oversee all machine repair. Issue special hall passes. Observe needed shop improvements and inform superintendent.

Safety Engineer: Serve as chairman of shop safety committee. Confer with each shop safety committee man daily. Report unsafe practices or safety hazards to the foreman or superintendent. Rotate safety posters each week. Take charge of first aid equipment and escort any injured students to the nurse (report to instructor). Keep safety record and chart. Keep safety file in order.

Lathe Foreman: Assign work on lathes. Assist operators to set up work on lathes. Give instructions to new operators on lathes. See that lathes are operated correctly. Make repairs with assistance of shop foreman or superintendent. Check safety of the machines and operators.

Milling Foreman: Assign work on milling machines. Assist operators to set up work on milling machines. Give assistance to new operators whenever necessary. See that machines are operated correctly. See that machines are properly oiled and cleaned. Make repairs with assistance of shop foreman or superintendent. Check safety of machines and operators.

Drilling and Sawing Foreman: Assign work on drill presses and power saws. Assist operators to set up work. Give instruc-

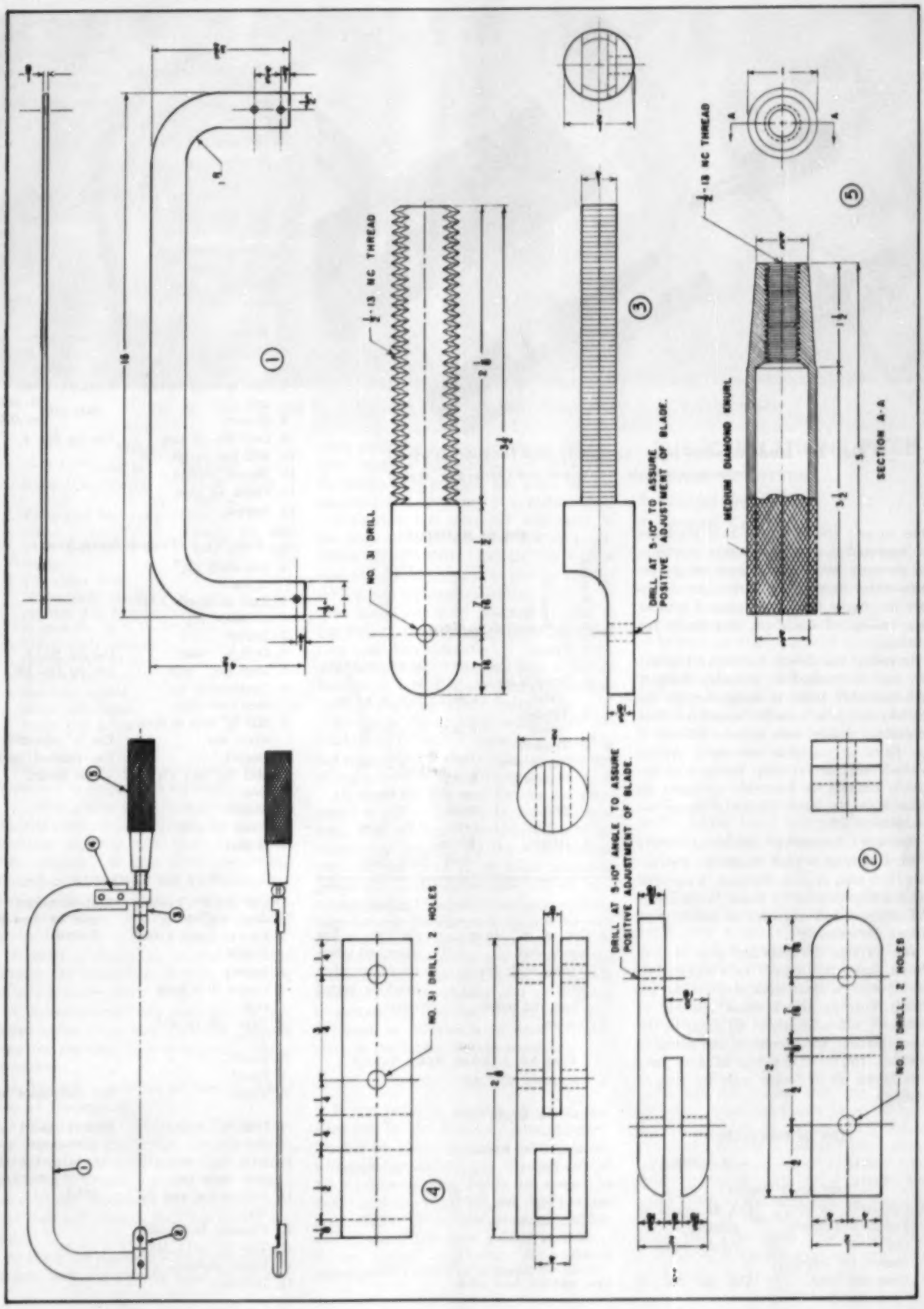

1/4-13 NC THREAD
NO. 31 DRILL
DRILL AT 5-10° TO ASSURE POSITIVE ADJUSTMENT OF BLADE.
1/4-13 NC THREAD
MEDIUM DIAMOND KNURL
SECTION A-A
NO. 31 DRILL, 2 HOLES
DRILL AT 5-10° ANGLE TO ASSURE POSITIVE ADJUSTMENT OF BLADE
NO. 31 DRILL, 2 HOLES

Fig. 2. A shop tested method for teaching mass production in the industrial-arts laboratory

Drawings by David Nystuen, student

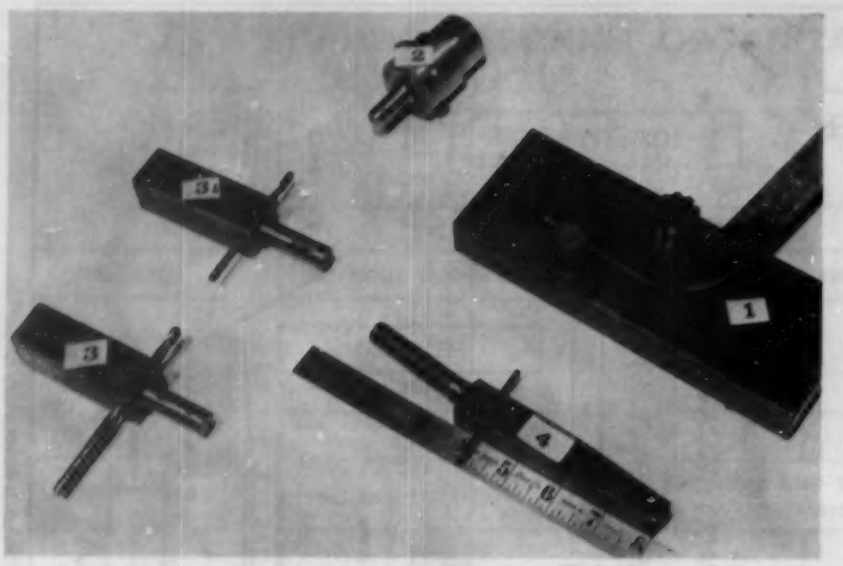


Fig. 3. Student made jigs — simplicity and function stressed
— Photographs by R. M. Worthington and Charles Lusk, student

tions to new operators. See that machines are operated correctly. See that machines are properly oiled and cleaned. Make repairs under supervision of foreman or supervisor. Assist production control man to keep record of stock cut and ready for routing.

Assembly and Bench Foreman: Instruct new men in method of assembly. Inspect each assembly prior to inspection by inspector. Keep a constant check so that production control man may be advised if any parts or materials are short. Advise methods engineer or shop foreman of desirable changes in assembly or parts to make assembly more efficient. Assign assemblers to jobs.

Operators, Assemblers and Bench Hands: Work according to plan or specific instruction from area or shop foreman. Keep area and machine clean at all times. Work safely and advise safety engineer of unsafe conditions immediately.

The working drawings and plan of procedure shown in Figure 2 were supplied to the students at their work stations. An assembly drawing and a detail drawing of each part was available at all times to the superintendent, shop foreman, and assembly foreman. The detail drawings of small parts were blown up to double scale for ease of reading.

PLAN OF PROCEDURE

Steps	*Key Points*
PART NO. 1 (FRAME)	
1. Cut stock to 20½".	Cut as square as possible. — Avoid waste.
2. Deburr and square end.	
3. Inspect for length.	
4. Heat and bend.	Use jig No. 1.
5. Cut off ¾" from handle end.	CAUTION — Use tongs and asbestos gloves when handling heated metal.
6. Inspect with template.	
*7. Clean and polish.	
8. Inspect.	
PART NO. 2 (FRONT BLADE YOKE)	
1. Cut stock 2⅛" ± ⅛6".	
2. Face to length 2.00 ± .010.	
3. Inspect for length.	
4. Cut radius.	Use ¾" radius form tool.
5. Inspect.	
6. Drill 9⅛6" hole.	
7. Countersink ⅛2" deep both sides.	
8. Mill 5⅛6" slot.	Be sure cutter is centered on workpiece before proceeding.
9. Turn opposite end to .475 ± .010.	
10. Inspect.	
11. Drill No. 31 pin hole.	Use jig No. 3.
12. Mill flat.	
13. Inspect.	
PART NO. 3 (TENSION SCREW)	
1. Cut stock 3⅝" ± ⅛6".	
2. Face to length 3½" ± .010.	
3. Inspect.	
4. Form end.	Use ¼" R forming tool.
5. Thread.	Be sure thread is correct before proceeding.
6. Inspect.	
7. Mill flats on thread end.	Distance across flats .250 $^{+.000}_{-.010}$
8. Inspect.	
9. Drill No. 31 hole.	Use jig No. 4.
10. Mill flat on pin end.	
11. Deburr threads.	
12. Finish all over.	
13. Inspect.	
PART NO. 4 (TENSION SCREW YOKE)	
1. Cut stock 2¼" ± ⅛6".	
2. Face to length 2.125 ± .020.	
3. Inspect.	
4. Drill ¼" hole.	Use jig No. 3.
5. Drill 2⅜6" hole.	Use jig No. 3A.
6. Countersink ⅛2" deep both sides.	
7. Mill ¼" hole to form screw slot.	Use ¼" end mill.
8. Inspect.	Use finished part 3 as gauge.
9. Mill 5⅛6" slot 1¼" long.	
10. Inspect.	
11. Finish all over.	
12. Inspect.	
PART NO. 5 (HANDLE)	
1. Cut stock (if using steel) 5⅛" ± ⅛6".	Cast aluminum may be used if desired.
2. Face to length 5.000" ± .010.	
3. Inspect.	
4. Center drill both ends.	
5. Turn o.d. to .975 ± .010.	
6. Inspect.	
7. Knurl.	
8. Taper.	Set compound at 87°.
9. Drill ¼" hole through.	Protect knurl in subsequent operations with sheet metal band.
10. Drill 27⅛4" hole 1½" deep taper end.	
11. Drill other end ¾" 3¼".	
12. Chamfer both ends.	
13. Tap ½" — 13 N.C.	
14. Finish all over.	
15. Inspect.	

BILL OF MATERIALS

Part No.	No. Needed	Name of Part	Material	Dimensions
1	1	Frame	Band iron	⅛ x 1 x 20½ in.
2	1	Front blade yoke	C.R.S.	½ x ½ x 2 in.
3	1	Tension screw	C.R.S.	½ x 3⅝ in.
4	1	Tension screw yoke	C.R.S.	½ x 2¼ in.
5	1	Handle	C.R.S. or Al.	1 x 5⅛ in.
	2	Pin	Drill rod	⅛ x ⅝ in.
	3	Rivets	Black iron	9⅛6 x ⅝ in.

*Finish will depend on equipment available (surface grind, spot-face, hand polish).

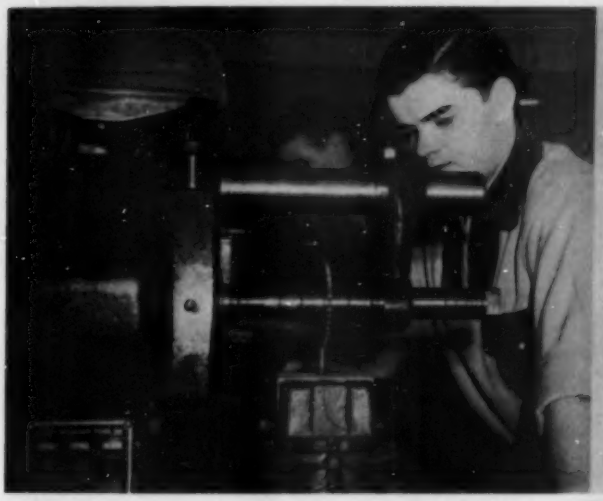


Fig. 4. Milling slot in yoke. Fig. 5. (at right). Final inspection and assembly

Assembly	
1. Drill 5/16" holes in frame (Part No. 1).	Transfer layout from parts 2 and 4.
2. Rivet part No. 2 to frame.	Cut off rivet heads. Pin both ends into countersink.
3. Rivet part No. 4 to frame.	
4. File rivets flush.	
5. Drive blade retainer pin into No. 31 hole in part No. 2.	
6. Drive blade retainer pin into No. 31 hole in part No. 3.	
7. Assemble tension screw and handle.	
8. Insert and adjust blade.	

Suggestions for shop instructors who are interested in testing this method:

1. Show one or more films portraying industrial shop activities. If possible use films stressing methods and shop procedures. Fine examples of such films are: "Shop Procedures" (McGraw Hill), "Productivity Key to Plenty" (Encyclopedia Britannica), and "Technique For Tomorrow" (Ford Motor Co.)

2. Hold a discussion of the film and present the possibility of *mass producing* an article in the school shop.

3. Select several items that might be produced in the school shop. Have the students vote for the item they would most desire to make.

4. Prepare a good set of working drawings of the project.

5. Take several field trips to manufacturing companies. Companies using materials similar to those used in the school shop would be desirable. Be sure the students are informed concerning jigs and fixtures so that they will observe their use during the trip.

6. Have the students write brief outlines of how they thought the items progressed from station to station throughout the factory. Make a comparison and show how the product did progress and point out the reasons for the sequence of operations.

7. Discuss the personnel who were in the shop but who were not operating machines. Using a chart illustrate where these men fit into the production picture and list their duties and responsibilities.

8. Assign advanced students to jobs in the shop carrying responsibilities for which they seem best suited.

9. Inexperienced students may either be assigned to operating positions or they may select the operation they desire.

10. Have the drawings enlarged on the blackboard or project them on a screen so the entire class may assist in the designing of any necessary jigs or fixtures.

11. Once the jigs and fixtures are completed it will be possible to make the trial runs. This will entail the instruction of inexperienced students by the area foreman with the assistance of all other advanced personnel. Considerable time will be consumed during this period and the students may become disheartened. It will be well to point out that during the retooling of an automotive plant for a new model car the production may be shut down for several months. Also, the change over of industry to warfare and then back to peacetime may be drawn as an example of what is taking place in the school shop in miniature.

If the paint is coming off your canister set in the kitchen, save yourself trouble by applying a thin coat of fresh, white shellac before you try to paint it again. The shellac holds to both the metal and the paint so you won't waste your effort. A surface coat of shellac will protect the new paint and keep it on longer. — *Shellac Information Bureau.*

PUBLIC RELATIONS PITCH

DeWEESE W. STEVENS
Rosemead High School
Rosemead, Calif.

The Los Angeles County Industrial Education Association under the sponsorship of David Taxis, consultant of industrial arts for Los Angeles County, came up with a new idea for a designed display booth to be used to display articles for the Association at various local, county, and state meetings. It was felt by some of the members of the Association that there was a need for a functional, portable, and easy-to-assemble booth, that would be an eye catcher when on display.

Deszo Sekely, machine shop and drafting teacher at Artesia High School, Artesia, Calif., took the problem of developing such a display booth under advisement. He gave this problem to one of his tenth year drafting classes as a class project to work upon.

Richard Dull, a member of that class, undertook the problem of designing this booth with a few other members of the class, and, after many days of work with close guidance from his teacher, the idea soon became a reality. The booth design began to take shape, and, but for a few changes, it began to look like the booth pictured in Figure 1. Figure 2 shows the approximate sizes used, and Figure 3 shows the booth as it looks when set up for use.

Through this project that was given to the whole class, the pupils began to learn the fundamentals of contemporary design. Those who believe in contemporary design believe that nothing should be hidden from view; therefore, everything about this booth is out in the open with nothing hidden. Some of the fundamentals of good design that were taken into consideration in designing this booth were aesthetic beauty of form, utility, and economy.

Fig. 1. Side view of the contemporary design booth of the Los Angeles County Industrial Education Association. At right — Fig. 3. Booth in use. Pictured left to right: Richard Dull, student, Mr. Deszo Sekely, instructor, and Richard Hartman, student, Artesia High School. Design of this booth also to be used in Mr. Sekely's book "Contemporary Projects" published by McKnight and McKnight

— Photographs by Earl Wilbert, Rosemead High School

After the class had finally finished designing the booth, the industrial-arts club of Artesia High School, sponsored by Mr. Sekely, and Richard Hartman, a member of that club, took up the project of actually constructing the booth from the working plans that were made by the drafting class. With the materials being furnished by the association, the club constructed the whole booth in time for the State meeting of the California Industrial Education Association at San Diego, Calif., on March 17, 18, and 19, 1955. This was the first time the booth was used for exhibition purposes. From reports of people that were at that meeting it made quite an impression with the people who attended the convention.

Features of the booth are: (1) it can be assembled and disassembled in 25 minutes; (2) it is completely self-supporting, with four main legs for support; (3) through a cam action under the center circle, it can be enlarged from a normal 7 ft. by 7 ft. to 6 ft. by 14 ft., adjusting to any area that may be needed; (4) it can be transported in an ordinary passenger car; (5) by using a peg board on the panels, it can hold many different kinds of items for exhibition; and (6) it carries its own circular tables, making it a complete booth in itself, with no need of adding extra furniture for exhibition purposes.

Los Angeles County Industrial Education Association is justly proud of its new booth of contemporary design. It is something that is far different from anything that has been done in the past. The association sincerely thanks Mr. Sekely for giving his time and efforts to this project. It gave his boys quite an opportunity to learn about contemporary design.

CHECK-OFF LIST FOR STUDENT FOREMEN

IRVING LERNER

Inglewood, Calif.

As with most contemporary school shops, I employ a student officer system of shop management. One of the duties assigned to the student foreman is the supervision of the daily cleanup. However, I have found that no matter how well the foreman is oriented, it is frequently necessary to follow him about in order to point out sloppy cleanup practices by the assigned workers.

I have found that a check list of the type presented herewith has aided the student foreman by giving him an organized system to follow. It has also helped student morale by providing for recognition for conscientious workers. This check list has also helped me locate the few workers who do not co-operate fully with their elected shop leaders.

This form may be added to, or modified to fit the needs of almost any shop situation, although most shop layouts will fit in the categories indicated on the form.

Foreman's Check List

	✔ When Comp.
Organization:	
1. Does every job have a worker?	.....
2. Have alternates been assigned to replace absentee workers?	.....
Benches:	
1. Has all scrap been put into the scrap box?	.....
2. Has all sandpaper been put into the sandpaper box?	.....
Benches:	
3. Are all workbenches dusted clean?	.....
4. Is the long bench by the drill press clean?	.....
5. Have all bench brushes been put away?	.....
Hand Tools:	
1. Have all hand tools been returned to their own racks?	.....
2. Have all clamps been returned and correctly placed in their cabinet?	.....
3. Have all files been cleaned?	.....
4. Are the plane irons retracted?	.....
5. Are all tools accounted for?	.....
Planning Areas:	
1. Are tables and equipment clean?	.....
2. Are they neatly arranged?	.....
3. Have all chairs and stools been returned?	.....
4. Have all magazines and books been returned to the shop library and neatly arranged?	.....
5. Is the metal bench clean?	.....
6. Have all wastebaskets been emptied?	.....
Finishing Room:	
1. Are the cans and their lid gutters clean?	.....
2. Are the lids on tight?	.....
3. Have the cans been returned to their proper place?	.....
4. Have the newspapers been replaced?	.....
5. Are there spots on walls and floor?	.....
6. Have all dirty rags and papers been emptied from wastebaskets?	.....
7. Were brushes washed in soap and water?	.....
8. Has sink been cleaned with steel wool and cleanser?	.....
Power Tools:	
1. Are all guards down?	.....
2. Are all cutting surfaces covered?	.....
3. Has sawdust been removed from tool?	.....

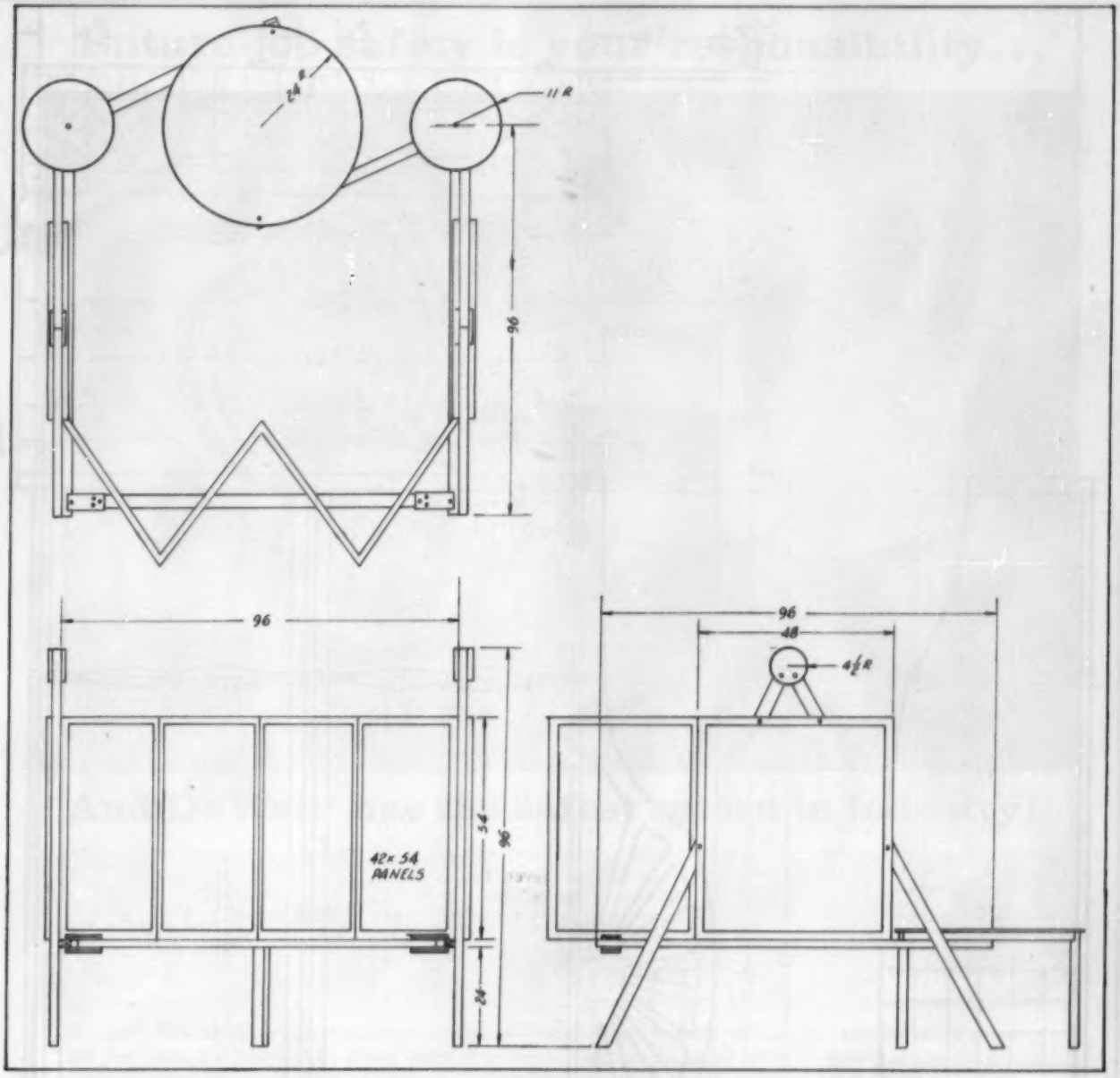


Fig. 2. Working plans of the display booth (Article on page 145)

Sweep I: (Front planning area to edge of workbenches)

1. Is floor clean of dirt, nails, scrap, sandpaper, steel wool, etc.? .....
2. Is there dust along edge of floor near walls? .....
3. Has all dirt been placed in waste can? .....

Sweep II: (Rear door to edge of workbenches)

1. Is floor clean of dirt, nails, scrap, sandpaper, steel wool, etc.? .....
2. Have areas under tables been cleaned? .....
3. Has area under long bench been cleaned? .....
4. Has all dirt been placed into the waste can? .....

Name of anyone who did an exceptional job today: .....

Name of anyone who did not co-operate with his co-workers: .....

.....

.....

Foreman ..... Period .....

Date .....

WALL SHELF

EDWARD GORAB

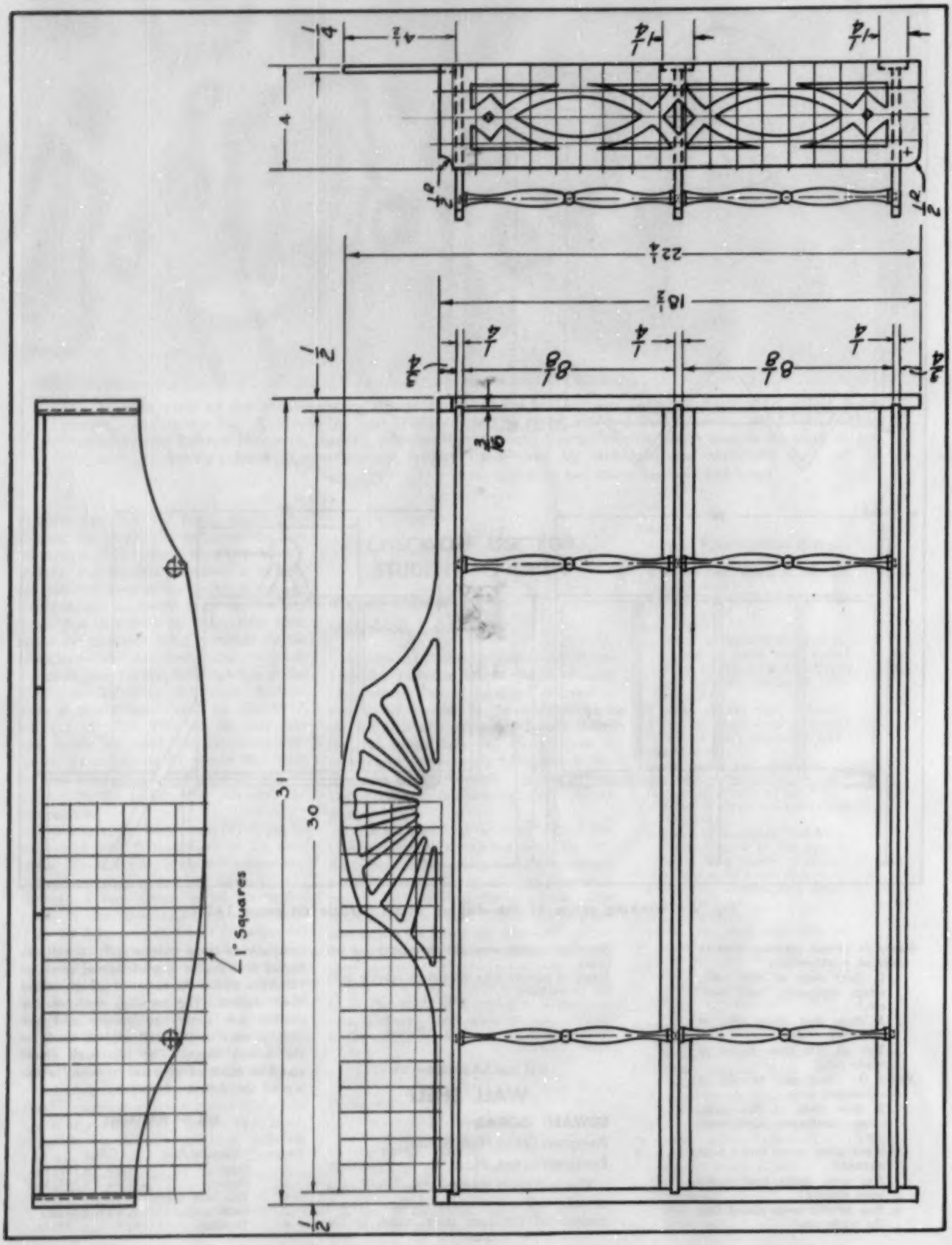
Pompton Lakes High School

Pompton Lakes, N. J.

The wall shelf described here is a copy of one, with a few minor changes, from a commercial furniture store, name of the company or store unknown. It is well designed and makes a professional piece of furniture within the range of a high school shop student. The turnings between the shelves are somewhat unique and not usually seen in the wall shelves made in the school shops. The top back shield could be made of plywood to avoid breaking of the delicate fretwork.

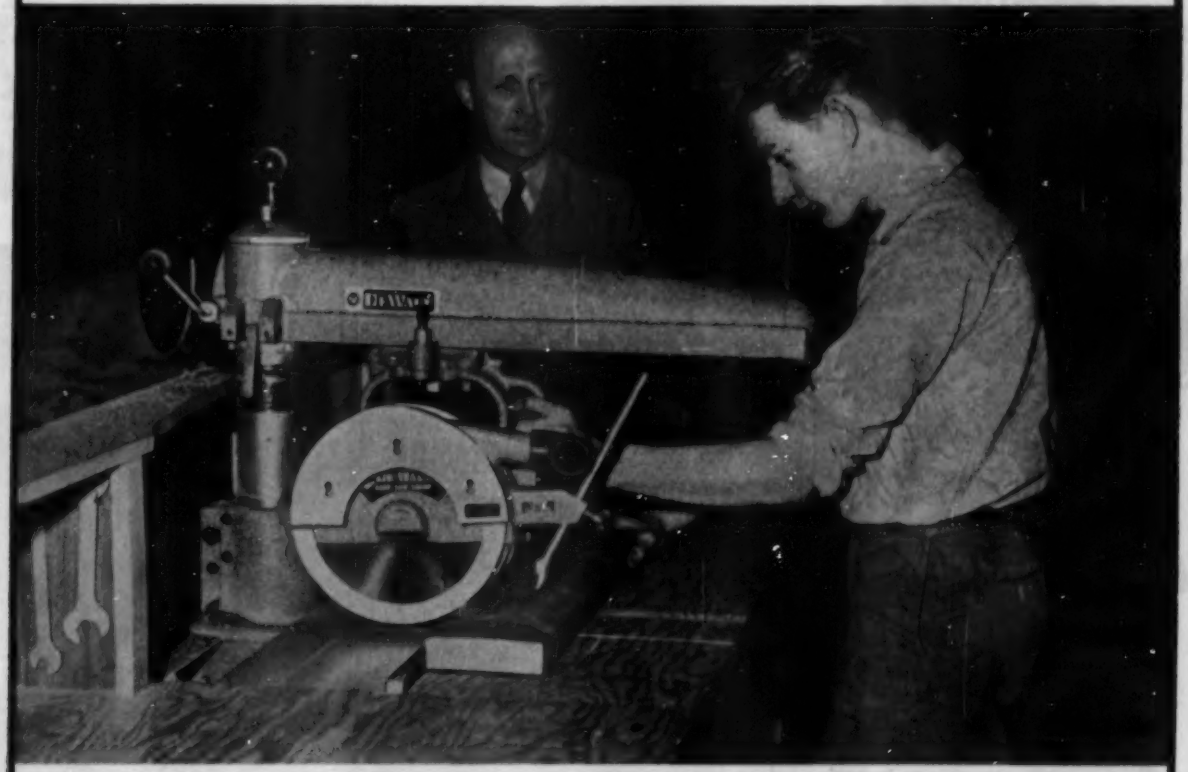
BILL OF MATERIALS

No. of Pieces	*Name of Part*	*Size*
2	Sides	½ x 4 x 18½ in.
3	Shelves	¼ x 6 x 30½ in.
1	Top back shield	¼ x 4½ x 30 in.
2	Back strips	¼ x 1½ x 30 in.
4	Turnings	¾ x ¾ x 8½ in.



Details of the wall shelf by Edward Gorab

Future job safety is your responsibility...



And De Walt® has the safest record in industry!

You need these exclusive operating safety features: **A**—Simpler, safer top-side cutting with exclusive safety guard. See your mark *and* your saw. **B**—Power brake stops saw in 4 seconds for *added* safety. **C**—Safety key switch prevents unauthorized use. **D**—De Walt becomes tilting arbor shaper with exclusive shaper guard—gives 50% more shapes per cutter. Combines 12 basic power tools. Builds into workbench, gives safer straight-line handling.

Train your students on an AMF De Walt—preferred in both home and industry for accuracy, versatility—*plus the safest record of performance.* Arm raises, lowers, swings 360°. Motor and saw ride on arm, rotate 360°, tilt downward past 90°. Powerful direct-drive motor accommodates any circular tool, saves cost of separate machines. De Walt's the saw your students will later use!

2 popular sizes for schools...GW-I, 1½ hp, 10″ size for industrial arts...GA-N, 3 hp, 12″-14″ size for vocational training.

See your supplier or send for FREE BOOKLET.

Another AMF Product
DE WALT
POWER TOOLS

De Walt Inc., Dept. IA-56-4, Lancaster, Pa., Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

☐ Please send me FREE BOOKLET on Job-Tested Safety Cutting Methods
☐ Please send information on De Walt 16mm sound classroom film

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☐ *Students!* Check here for special literature

Your Choice

SIMONDS

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SAWS

Get better quality work with these Simonds guaranteed saws. Thirteen types for all your needs — including Dado Heads and Carbide Tipped Saws. Now at popular prices — the finest saws made. GUARANTEE — Made of Simonds steel fully guaranteed against any defect in material or workmanship.

Rip . . . Cut-off . . . Easy Cut and Combination	
4"	1.75
7"	2.00
8"	2.15
9"	2.65
10"	3.15
12"	4.35

Supplied with round or special shape holes as shown.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.

ASSOCIATION NEWS

(Continued from page 6A)

youth and their parents with the employment opportunities in the metropolitan Detroit area.

This exhibition is sponsored jointly by the public, private, and parochial schools and the Institute for Economic Education.

The exhibition consists of live presentations and demonstrations arranged by business and industry. Each exhibit (booth) is staffed by authoritative personnel people, and, in many instances, employees are actually performing industrial, clerical, and professional work.

Students are scheduled, during the school day, to be transported from their school to the exhibition hall. The arrangement provides that students will be in the exhibition hall one hour. During this time, they gather occupational information by visiting booths, observing demonstrations, securing literature, and discussing job opportunities with personnel people at the various booths.

Several interview booths are provided. Each booth represents a job family, and each booth is staffed by experts in one particular occupational area. Each high school selects a specified number of 12th grade students who are to take assigned interviews. These students are then required to disseminate the

(Continued on page 19A)

1954 Kentucky-Tennessee Industrial Arts Teacher-Trainer Conference

Front row, left to right: Richard Connaway, Austin Peay State College; W. B. Nalbach, Western State College; J. T. Mays, Morehead State College; E. S. Voorhies, Middle Tenn. State College; H. B. Clark, Western State College; J. H. Gonce, Middle Tenn. State College; C. B. Barnes, Western State College.
Second row, left to right: Willard J. McCarthy, Murray State College; Thomas E. Myers, Eastern State College; Leon Bibb, Austin Peay State College; J. Homer Davis, Eastern State College; George T. Lilly, Murray State College; Joseph H. Moore, Tennessee Poly. Inst.; L. T. Smith, Western State College.
Third row, left to right: Norman H. Roberts, Morehead State College; John D. Bowlott, Eastern State College; H. L. Oakley, Murray State College; Ralph W. Whalin, Eastern State College; O. L. Freeman, Middle Tenn. State College.

Directors of secondary schools, from Mexico who visited Wayne University in November, 1955. (Left to right) Luz Oyo de Llano, Roberto Villasana, Gerald Baysinger (Wayne University), Elena Orozco, Juan Castellanos, Herlinda Garcia, Marino Ahuatzi, Abel Rodriguez, Augustin Pena, interpreter

WILTON'S RESEARCH PAYS OFF!

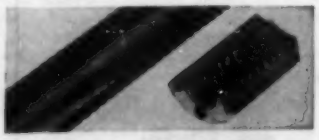
NO MORE REPLACEMENT PROBLEMS WITH WILTON'S NEW *RAPID TITAN*® VISE!

The heart of the story

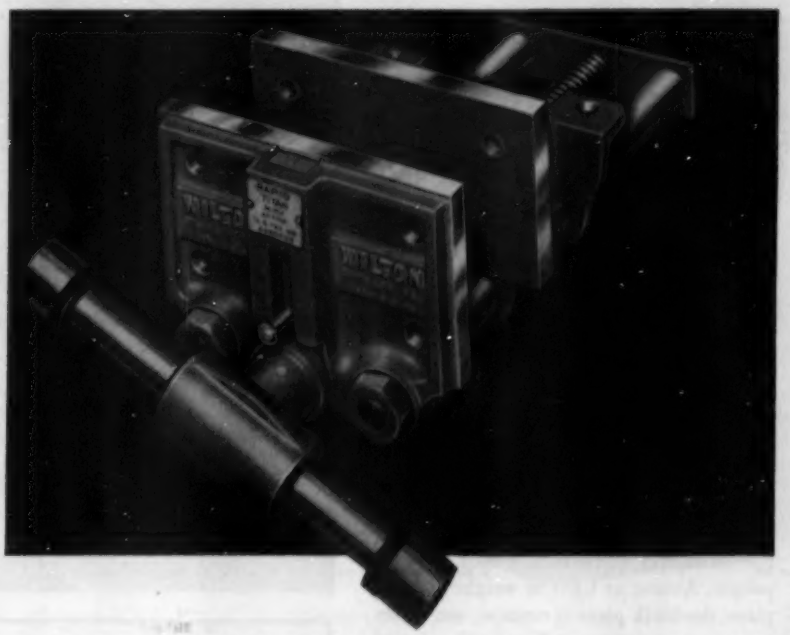
WILTON'S patented, **indestructible** rapid action **nut!**

Wilton's Rapid Titan Nut—made of steel and used with a continuous screw—far outwears the ordinary bronze nut used with an intercepted screw. Even under abuse, the Rapid Titan Nut DOES NOT WEAR OUT!

Wilton's new concept of nut design allows Rapid Titan Vises to operate with FREE SLIDING ACTION, yet fool-proof positive locking screw action is instantly available. And here is good news: *there is no limit to take-up;* you can tighten a full revolution or more!



Obsolete Intercepted Screw and Bronze Nut



Get the fine features of Wilton Vises with no premium in price!

- Sturdier construction—up to 7 lbs. heavier than competitive equivalents
- Solid aluminum handles at the price of wood or steel
- Heavy duty machined steel back plate
- Close machining throughout—fits standard 2¼" bench top
- Unconditional 3-year guarantee

Available in 16 Models — both continuous screw and rapid acting

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SCHILLER PARK, ILLINOIS
Manufacturers of the world's broadest line of vises and clamps

Wilton Machinists' Vises

Wilton C-Clamps

Automatic Machine Vises

Train Students with the SKIL Tools They'll Use As Professionals!

When the vocational training student becomes a professional, he'll want to work with the professional's favorites—time-saving, quality SKIL tools! Then what could be more logical than to equip the student in his classroom with the tools he'll use on the job?

Simplicity of operation and ease of handling make SKIL tools ideal for school maintenance jobs, too. Repairs can be accomplished faster, easier—at lower cost. Get the complete story on what SKIL tools can do for *your* school—in training, in maintenance. Contact your SKIL Distributor today!

SKIL 3" Electric Plane For All High-Speed Edge and Surface Planing

New design and features make it ideal for all training and maintenance needs. Ruggedly built to withstand abuse and inexpert operation by students. Cog-belt drive requires no lubrication . . . prevents damage due to neglect where tool is used by *many* people. Almost as light in weight as hand plane, the SKIL plane is easier to use. Gives a smooth, true, ripple-free finish. Speed of cutter head: 13,500 r.p.m.

New SKIL Plane Stand converts SKIL plane to a jointer-planer in seconds! Provides solid platform to give more accurate smoothing, surfacing, beveling and jointing of smaller work. Heavy cast iron base mounts to workbench. Quick-action spring safety guard.

SKIL
PORTABLE TOOLS

Wide range of SKIL Drills assures exact power and capacity for all school needs.

Fast-finishing SKIL Belt Sanders with belt widths from 2¼" to 4½"—models available with or without dust collectors.

SKIL Radial Saws are finest for ease of operation! Exclusive Retracto-Glide arm provides clear work area at all times, is safer for maintenance and instruction.

Sturdy construction, sealed ball bearings. The only low priced bench grinder with such important safety features as complete wheel guards and exhaust chutes.

SEE YOUR DISTRIBUTOR FOR COMPLETE INFORMATION OR CALL YOUR NEARBY SKIL FACTORY BRANCH

ASSOCIATION NEWS

(Continued from page 16A)

information received to the 12th grade students in their respective schools.

Each participating school provides an orientation program prior to the visit to the exhibition.

Careers Unlimited was organized in 1954 and is scheduled annually. The 1956 exhibition is scheduled to be held March 12–23 at the University of Detroit Memorial Building. The special evening showings for parents were scheduled as follows: Monday, March 12, 8:00–10:00 p.m.; Wednesday, March 14, 8:00–10:00 p.m.; and Thursday, March 22, 8:00–10:00 p.m.

♦ The twenty-third Annual Spring Conference of the Connecticut Industrial Arts Association will be held April 20 and 21, 1956, at the Teachers College of Connecticut in New Britain, Conn.

The theme for the conference will be "Functional Design — Its Place in Industrial Arts."

The main address at this meeting will be delivered by Dr. M. Ray Karnes, professor and chairman of the division of industrial education at the University of Illinois. — *George F. Metz, publicity chairman.*

♦ The West Virginia Industrial Arts Association will meet at Jackson's Mill on April 13 and 14, 1956.

The theme for the conference will be "For Tomorrow . . . Prepare Today."

The general program will feature a series of problem clinics under such topics as "Student Clubs," "Teaching Aids," "Community Relationships," and "Adult Education."

Leaders to appear on the program include: Dr. Delmas Miller of University High School, Morgantown; Dr. Shriver Coover of Pennsylvania State Teachers College, California; C. D. Brown of State Department of Education; Dr. Maley of Maryland; and Dr. Jarecke of West Virginia University.

The officers in charge will be: president, Andrew K. Ault; vice-president, Richard Glass; secretary, Bond Bible; commercial exhibit chairman, W. W. Rose of Clarksburg; housing chairman, Jackson Townsend of Weston; and Ralph Donohoe, door prizes. — *Lawrence E. Hayes.*

Personal News

J. R. MULHOLLAND RETIRES

The Kanawha County Industrial Arts Association honored J. R. Mulholland, a pioneer West Virginia industrial-arts teacher, at a banquet on December 8, 1955. The occasion marked the completion of 36 years of teaching and supervisory service in Charleston and Kanawha County, W. Va.

Mr. Mulholland was graduated from the Stout Institute and began teaching at Kasson, Minn., in 1912. After three years in this position he accepted a position as teacher at Clairton, Pa., where he remained for three years. He then entered the American Expeditionary Forces in France as an orientation officer. At the end of the conflict he returned to his parental home at Menominee, Mich. Soon afterward he married Miss Ruth Thomas of Dravosburg, Pa. They have two children.

In the fall of 1919 Mr. Mulholland accepted a position as teacher and half-time super-

(Continued on next page)

Your students will enjoy building any of these interesting projects. The clear, easy-to-follow plans—plus big easy-to-work panels—make for professional-like results when you use

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INSIST ON DFPA-INSPECTED FIR PLYWOOD

37 PLANS for classroom projects

FREE to industrial arts instructors

CHECK PLANS YOU WANT— MAIL COUPON—THAT'S ALL!

- ☐ UTILITY TABLE
- ☐ STACKING CABINETS
- ☐ BUFFET STORAGE CABINET
- ☐ UTILITY SHELVES
- ☐ TOOL-CABINET WORKBENCH
- ☐ DOUBLE DUTY DESK
- ☐ COFFEE TABLE
- ☐ BEDSIDE TABLE
- ☐ STUDENT'S DESK
- ☐ CHEST OF DRAWERS
- ☐ TWO-DOOR CABINET
- ☐ TV STOOLS
- ☐ CHILD'S TUMBLER
- ☐ CHILD'S TABLE AND STOOLS
- ☐ BUNK BED
- ☐ BOAT BED
- ☐ TRAIN TABLE CABINET
- ☐ COVERED SAND BOX
- ☐ TOY STORAGE BLOCKS
- ☐ PORTABLE GARDEN CADDY
- ☐ SECTIONAL PATIO TABLES
- ☐ OUTDOOR SERVING WAGON
- ☐ SUN SLED
- ☐ GARAGE STORAGE BOX
- ☐ GARDEN CABINET
- ☐ PATIO FURNITURE
- ☐ ODDS 'N ENDS CABINET
- ☐ 15' SAILBOAT
- ☐ 20' SAILBOAT
- ☐ 11'3" OUTBOARD
- ☐ 9' FLAT BOTTOM DINGHY
- ☐ 7'9" PRAM DINGHY
- ☐ 13'4" OUTBOARD
- ☐ 13'6" INBOARD RUNABOUT
- ☐ HOG HOUSE
- ☐ POULTRY HOUSE
- ☐ ROLL-AWAY POULTRY NEST

DOUGLAS FIR PLYWOOD ASSOCIATION, DEPT. IA, TACOMA 2, WASH.

Without obligation or charge, please send me a copy of the plans I have checked above.

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SCHOOL.....

ADDRESS.....

CITY.....ZONE....STATE.....

(Good in USA Only)

PERSONAL NEWS

(Continued from previous page)

visor in Charleston, W. Va. The department had a steady growth until 1937 when Mr. Mulholland was appointed director of industrial arts for all the Kanawha County Schools. The inauguration of a building expansion program in 1938 saw new shops set up in all junior high schools in the county and all existing shops were renovated. Mr. Mulholland was instrumental in having a new course of study set up in 1941 to cover both unit and general shops. In 1951 an accompanying shop manual was written to vitalize new developments.

Mr. Mulholland and the late Dr. Edward Maclin were instrumental in organizing the first state industrial-arts association in West Virginia. Mr. Mulholland served as chairman for several years.

During Mr. Mulholland's tenure in Charleston he completed work for a master's degree at Stout Institute and became affiliated with Epsilon Pi Tau and Chi Beta Phi fraternities. He has been a continuous member of NEA, AVA, and AAIA.

Since 1932 Mr. Mulholland has served as part-time instructor in the engineering department of Morris Harvey College, a position which he continues to hold, in his retirement from the public schools.

CHANGES AT SAN JOSE STATE COLLEGE

The following changes have taken place in the industrial-arts department at San Jose State College, San Jose, Calif.:

Forrest E. Peifer, head of the division of mechanical drawing, retired.

Robert P. Johnson, head of the automotive area, resigned to accept a position with the government in the Philippine Islands, with headquarters at Manila, to assist in the rehabilitation of forty vocational schools. He will work primarily in the automotive area.

The following have been added to the department:

Dr. Ralph P. Norman, formerly from the University of Minnesota, having completed his Ph.D. degree during the past summer session.

Ralph C. Bohn, with an A.B., and M.A., from Wayne University, where he is a doctoral candidate.

Louie Melo, A.B., at San Jose State College, M.A., at Stanford University. He was on the staff of the latter institution during the past year as a liaison officer in building programs.

Jack Chaplain, A.B., San Jose State College, M.A., Stanford University. For the past seven years Mr. Chaplain has been head of the industrial-arts department of Fremont Union High School, Sunnyvale, Calif.

On a part-time basis the following have been added to the department:

Lou Ales, A.B., San Jose State College, a printer by trade, and proprietor of the Valley Press, San Jose, Calif.

E. L. WILLIAMS MEMORIAL

A new industrial vocational education scholarship established at Texas A. & M. College by Mrs. E. L. Williams as a memorial to her husband — for many years vice-director of the Engineering Extension Service — has been awarded to Gordon Richard Demarrais of Oradell, N. J., a junior student majoring in industrial education.

A past president of the American Vocational Association, Mr. Williams went to A. & M. College in 1925. He headed the department of industrial education many years before rising to the position from which he retired just prior to his death in June, 1954.

Mr. Williams pioneered in the establishment of vocational teacher training and was the leader of Texas training courses for industrial and municipal workers. His work as a leader in the field was widely known throughout the United States.

♦ Dr. R. Lee Hornbake and Dr. Donald Maley have been asked to write a chapter for the Sixth Yearbook for the American Council on Industrial Arts Teacher Education. Dr. Hornbake's chapter will be on "Philosophical Viewpoints," and Dr. Maley's on "Methods of Teaching."

♦ O. H. Beaty, who has served as Kansas State Supervisor of Trade and Industrial Education for the past 10 years, has accepted a position in Iowa to work with Harry Carmichael, State Supervisor of Trade and Industrial Education. Upon Mr. Carmichael's retirement in June, 1956, Mr. Beaty will become State Supervisor for Iowa.

♦ Eugene Carrozza has joined the science staff of the New Brunswick School of the Middlesex County Vocational and Technical High Schools, New Brunswick, N. J.

♦ George W. Byrd, teacher of agriculture at Port Jefferson, N. Y., has two winners in the annual James F. Lincoln Arc Welding Foundation program for high school students living on farms. The boys, Forrest B. Randall and George Bobinski, each received $50 awards for their welding construction project reports.

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BUILT BY HAMILTON
Hamilton Student Tables
...hard-working and handsome,
in 6 smart new colors!
Student art and drafting tables by Hamilton are smartly designed, solidly constructed of Northern Hard Maple and offered in a range of handsome new finishes—Blonde, Driftwood, Ocean Spray, Saddle Brown, Honey Maple or Granite Gray.
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These highly practical units are only a small part of Hamilton's current school equipment line. Drop us a card or letter, and we'll keep you completely posted on new equipment for schools—by Hamilton.
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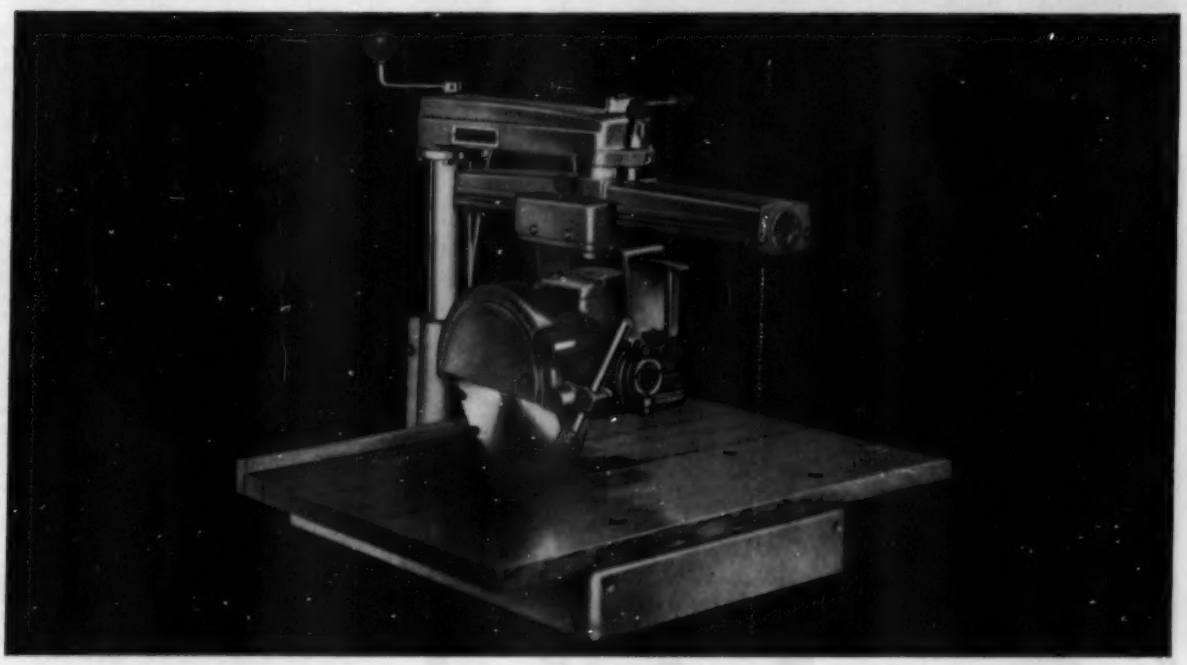
HAMILTON MANUFACTURING COMPANY • Two Rivers, Wisconsin

now the new ROCKWELL-BUILT DELTA "900" radial saw



To its great radial saw line Delta now adds the most powerful, most versatile, most useful 9" radial saw ever built! Delta's great new "900" is ideal for basic radial saw training because it gives you all these "big saw" features—at low cost!

EXCLUSIVE "TURRET ARM" ACTION—The *only* 9" radial saw with the double over arm construction preferred in big industrial saws. Pivot point *always* stays over the center of the work table for greater capacity, safety, versatility and accuracy.

TRUE ¾ HP MOTOR—Guaranteed for one full year! The *biggest*, most *powerful* motor on *any* 9" radial saw—makes heavy cuts faster, easier.

SELECT EDGE GRAIN FIR TABLE—Only the *finest* prime wood is used for freedom from warpage or distortion.

SAFE UP-FRONT CONTROLS—All operating controls, including new safety switch, up front within easy reach.

EXCLUSIVE "WIDE BEARING" CONSTRUCTION—Carriage rolls on extra wide-spaced bearings for greater rigidity, years of reliable operation with low maintenance.

Compare the new Delta "900" with any other saw of comparable size—or price! Then make up your own mind! Your Delta Dealer is listed under "TOOLS" in the yellow pages. Send the coupon for new catalog.

SEND FOR ALL THE FACTS—NOW!

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☐ Please send name of my nearest Delta Dealer.

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News Notes

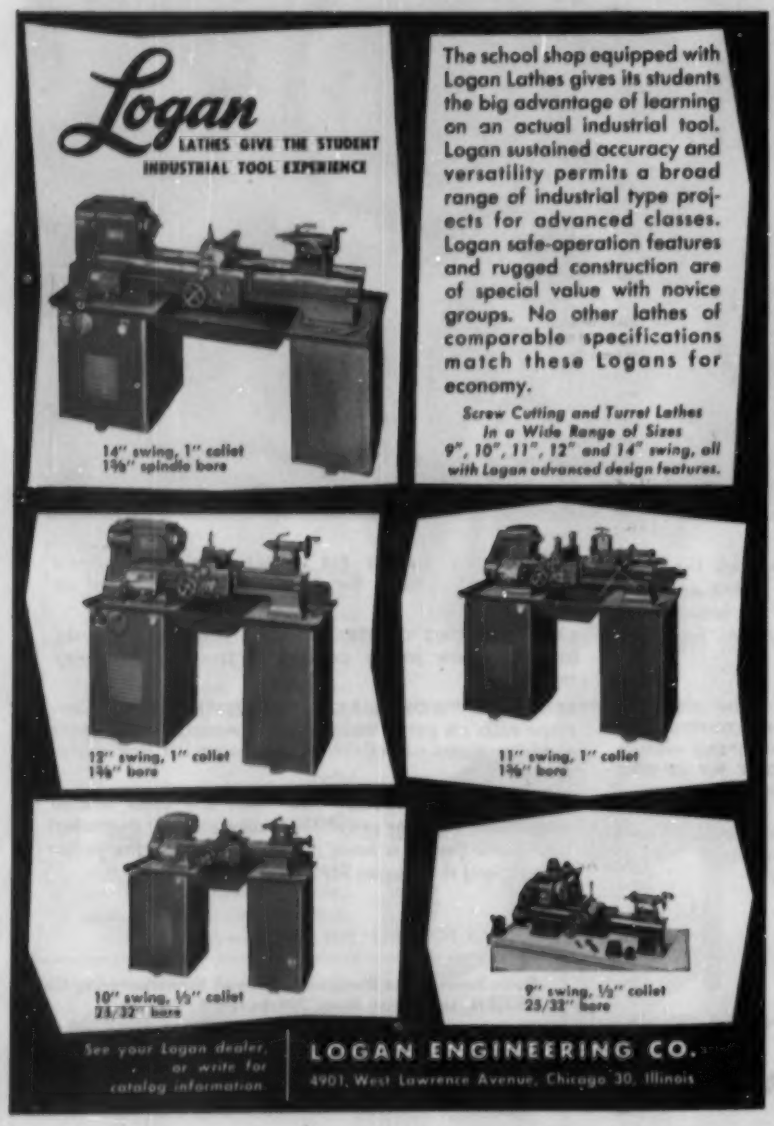
EDUCATORS FROM DIVERSE FIELDS NAMED TO JUDGE HIGH SCHOOL PHOTO CONTEST

A panel of five people including outstanding educators and photographers has been named as judges for this year's $5,000 National High School Photographic Awards, sponsored by Eastman Kodak Company.

Included in the group are: Glenn Hanson, assistant director of the Illinois State High School Press Association; C. B. Neblette, chairman, Division of Photography and Printing, Rochester Institute of Technology, Rochester, N. Y.; Sister Mary Janet, S.C., Ph.D., curriculum consultant, Secondary Schools, Catholic University of America, Washington, D. C.; Victor Singer, co-ordinator of the School Museum Program for the New York City Board of Education; and Kenneth W. Williams, manager of the Photographic Illustrations Division, Eastman Kodak Company.

Winners picked by this year's NHSPA panel will be announced in May. The contest, open to all students in daily attendance (grades 9–12) in public, parochial, and private schools in the U. S. and its territorial possessions, will close March 31, 1956. Entries received up through that date will be eligible for the 256 prizes worth a total of $5,000.

Rules folders and free literature may be obtained by writing to: National High School Photographic Awards, 343 State Street, Rochester 4, N. Y.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14" swing, 1" collet
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The school shop equipped with Logan Lathes gives its students the big advantage of learning on an actual industrial tool. Logan sustained accuracy and versatility permits a broad range of industrial type projects for advanced classes. Logan safe-operation features and rugged construction are of special value with novice groups. No other lathes of comparable specifications match these Logans for economy.
Screw Cutting and Turret Lathes In a Wide Range of Sizes
9", 10", 11", 12" and 14" swing, all with Logan advanced design features.
12" swing, 1" collet
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25/32" bore
See your Logan dealer, or write for catalog information
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♦ A graduate program leading to the degree of doctor of philosophy in ceramics has been established at the state college of ceramics, Alfred University, Alfred, N. Y.

Alfred has been a leader in ceramic education for fifty years and has offered graduate study leading to a master's degree in ceramics since 1952.

♦ An enlarged and completely revised edition of the U. S. Department of Agriculture's Wood Handbook has just been issued by the U. S. Forest Products Laboratory at Madison, Wis.

Since the handbook was first published in 1935, it has been recognized as the outstanding reference book on the properties and structural uses of wood. It is widely referred to and quoted in specifications, building codes, engineering and structural textbooks, and other publications as a basic authority.

The revised, 1955 edition of the "Wood Handbook" can be obtained from the *Superintendent of Documents, Government Printing Office, Washington 25, D. C.*, for $2 per copy, cash or money order.

♦ The National Executive Board of the Civil Air Patrol has established three four-year aeronautical engineering scholarships for outstanding CAP cadets to be awarded first in 1957.

These scholarships can be used in any accredited university or college giving a bachelor's degree in aeronautical engineering. They will be known as the General Carl A. Spaatz Scholarship, the General Lucas V. Beau Scholarship, and the Colonel D. Harold Byrd Scholarship.

Candidates for the scholarships must be of good moral character, have graduated or be due to graduate during the current academic year from a secondary school, and must have successfully completed certain specific high school courses. Each candidate must also have qualified for a CAP Certificate of Proficiency, be an outstanding Civil Air Patrol cadet, and have manifested the qualities of leadership in his CAP work. All applicants must pass the College Entrance Examination Board test.

For information write to Office of Information Services, Headquarters CAP-USAF, Bolling Air Force Base 25, D. C.

♦ The Masonite Corporation, 111 West Washington St., Chicago 2, Ill., has published a 12-page pamphlet titled "Masonite Presdwood Products," giving a full description of the physical properties of the various types of Presdwood that they manufacture.

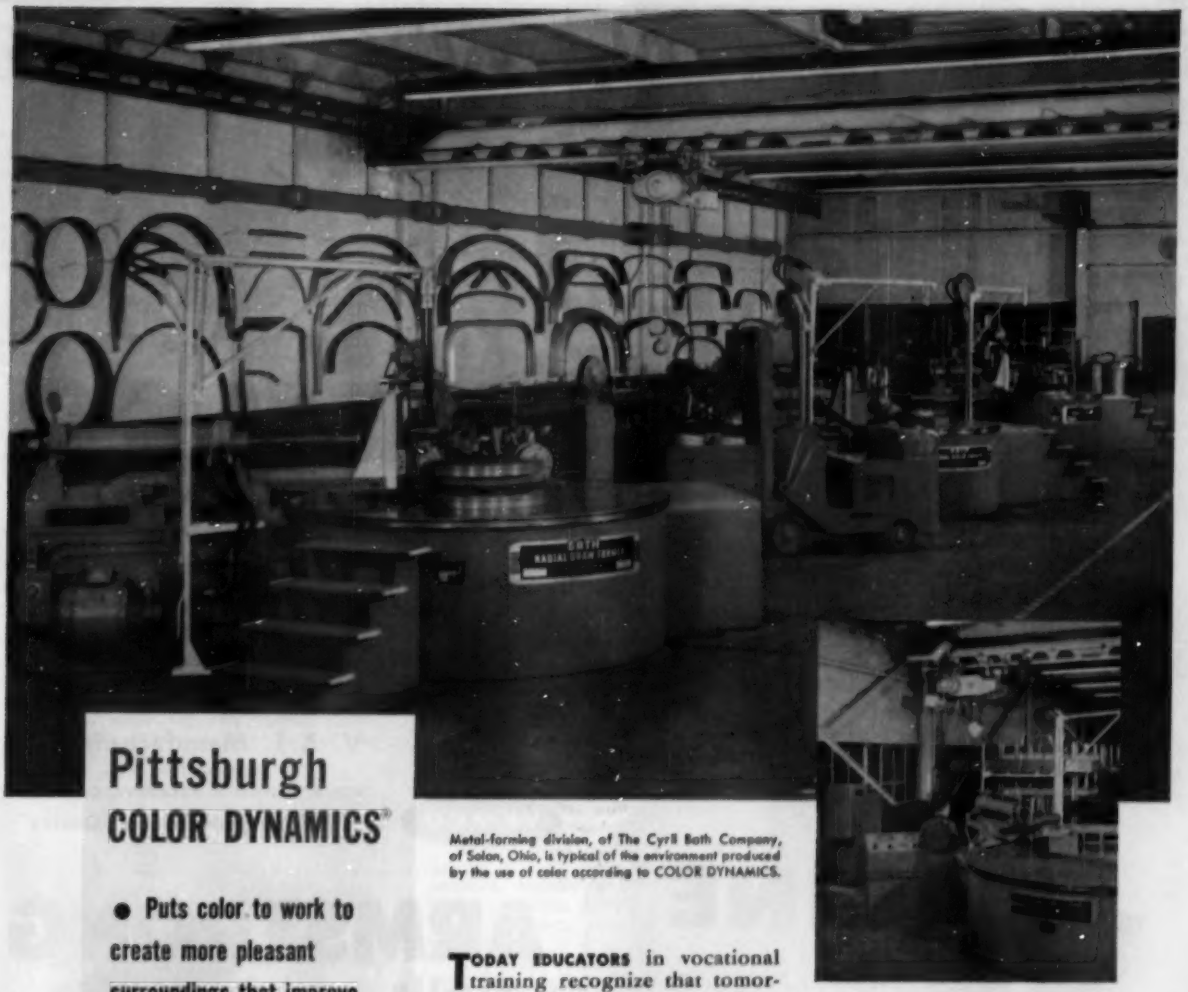
It also explains how and where the various kinds may be applied, how they may be worked, bent into place, used at corners, and fastened.

♦ The H. W. Wilson Co., 950–972 University Ave., New York 52, N. Y., just published the 22nd annual of "Doctoral Dissertations" containing a total of 8812 theses accepted by American universities during the past year. In his preface, editor Arnold H. Trotier notices that this is the first time since the end of World War II that the number of dissertations has shown a decrease. The total for 1953–54 was exactly 9000.

♦ The fall semester at San Jose State College, San Jose, Calif., has broken all previous enrollment figures with an enrollment of 9609 individuals, or a full-time enrollment of 8520 students. During the 1954–55 college year the institution gave instruction to 14,681 students. This includes the evening program, the summer session, and extension work. The local Chamber of Commerce estimates that the students, the faculty, and the nonteaching personnel contribute fifteen million dollars yearly to the business and civic life of the community.

♦ An extensive building program is under way at San Jose State College, San Jose, Calif., and plans are being made to accom-

(Continued on page 25A)



Metal-forming division, of The Cyril Bath Company, of Solon, Ohio, is typical of the environment produced by the use of color according to COLOR DYNAMICS.

Pittsburgh COLOR DYNAMICS®

● Puts color to work to create more pleasant surroundings that improve productive efficiency and morale in modern plant where heavy metal-forming machinery is built!

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We'll be glad to make an engineered color study—FREE!

● Write today for a free booklet explaining how Pittsburgh's COLOR DYNAMICS can be put to work. Better still, we'll be glad to demonstrate the benefits of this painting method in your classroom. We'll provide an engineered color study without cost or obligation. Call the Pittsburgh Plate Glass Company branch nearest you and arrange to have a representative see you. Or mail this coupon.

TODAY EDUCATORS in vocational training recognize that tomorrow's skilled shopmen must have more than a knowledge of machines, methods and metals. They must also know how to put color to work in the plant or the office to turn out more and better work.

● **Pittsburgh's system** of COLOR DYNAMICS is based upon the influence which colors exert on human beings. Tests have shown some colors stimulate, others soothe and relax, while many fatigue, irritate and depress.

● **By using color** according to COLOR DYNAMICS on machines, the operator's attention is focused better on his work. Working parts are distinctly separated from stationary parts and material being fabricated. Eye travel is reduced. All this helps to lessen eye fatigue and nervous tension.

● **Morale-building colors** on walls and ceilings not only improve visibility, but also promote cheerfulness. This improves morale of workers. Safety colors on motorized equipment, cranes and traffic lanes reduce danger of time-loss accidents.

● **Thousands of plants** have been painted the COLOR DYNAMICS way because it is recognized as a distinct contribution to modern production technique. Why not begin now to teach your students the important advantages of such functional use of color?

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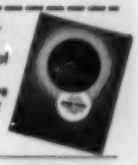
☐ Please have your representative call for a Color Dynamics Survey without obligation on our part.



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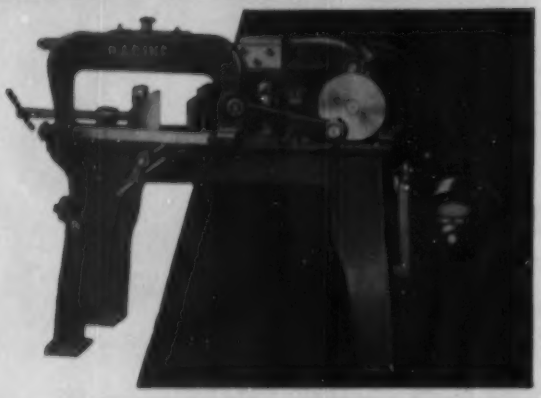

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"Utility" HYDRAULIC METAL SAWS

Your most ECONOMICAL INVESTMENT in metal-cutting saws because it requires a minimum of maintenance.

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NEWS NOTES

(Continued from page 22A)

modate 11,700 full-time enrollment students by the fall of 1961. Included in the building program is a new Industrial Arts Building. Tentative plans are currently under way and it is expected that funds will be available in 1957 for this much needed edifice. Currently, the main building is inadequate and the department is housed in various temporary buildings over an area of several city blocks.

♦ The Pennsylvania School for The Deaf, Philadelphia, Pa., emerged with seven winners, three of them receiving cash prizes, in the Ninth Annual Ford Industrial Arts Awards Contest.

Oscar E. Holmes, Chester Division of the Ford Motor Co., made the following presentations to our winners, representing the exploratory print shop, metal shop, and crafts class at a special assembly program: (1) Gary Reed, striped warp beach stole, first prize — $100, a gold pin, and a certificate of merit. (2) Charles M. Fultz, letterheads, honorable mention — $20, a gold pin, and a certificate of merit. (3) George Roller, aluminum name plate, honorable mention — $20, a gold pin, and a certificate of merit. (4) Alvah R. Cooley, striped scarf, a place — a gold pin, and a certificate of merit. (5) Barton Messner, historic antique linen piece, a place — a gold pin, and a certificate of merit. (6) William Lau, desk lamp, a place — a gold pin, and a certificate of merit. (7) Paul Moyer, child's red apron with crayons, a place — a gold pin, and a certificate of merit.

TOP ROW: *Mr. Arthur C. Wenzel, Principal of the Vocational Department;* **Miss Alice E. Clark, teacher in Crafts;** *Mr. Willard Randolph, teacher in Exploratory Printing;* **and** *Mr. Frank Sembello, teacher in Metal Shop.*

BOTTOM ROW: George Roller, Honorable Mention; Gary Reed, First Prize; Charles M. Fultz, Honorable Mention; and William Lau, A place.

♦ The Eleventh Annual Workshop on High School Publications will be conducted by the Ohio University School of Journalism in Athens, Ohio, beginning Sunday afternoon, June 17, and continuing through Saturday noon, June 23.

Last year's record attendance included 894 students and advisers from 229 high schools in 11 states.

Prof. L. J. Hortin, director, has announced that the six-day Workshop will include seven major areas: (1) editing and advising of regular letterpress newspapers; (2) editing and advising of yearbooks; (3) business phases of newspapers and yearbooks; (4) editing and advising of mimeographed newspapers; (5) editing and advising of offset newspapers; (6) photography; (7) radio-TV journalism.

Requests for reservations and information should be sent to Dr. L. J. Hortin, director of the School of Journalism, Ohio University, Athens, Ohio. Checks for laboratory fees and board and room are to be made payable to Treasurer of Ohio University, and will be payable in advance or at the beginning of the Workshop.

Each high school student attending the Workshop will be charged a laboratory fee of $6.50, payable in advance or upon registration. No lab fee will be charged for advisers.

Room and board will be available for students and advisers in University residence halls. Rooms will be available beginning Sunday afternoon, June 17. Meals will start Sunday evening, June 17, and continue through Saturday noon luncheon, June 23. The board and room charge for the entire six-day period will be $16.

♦ Recognizing the growing need for competent and adequately prepared teachers, Union Carbide and Carbon Corporation recently announced an important amplification of its undergraduate scholarship plan to include teaching scholarships, as well as the research and business career scholarships previously announced.

Union Carbide's over-all aid to education now provides benefits for over 500 scholars, and financial assistance for 102 colleges and 34 regional and state associations of liberal arts colleges.

For information write to *Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y.*

♦ Boston University has received a grant of $69,000 from the Office of Vocational Rehabilitation of the United States Department of Health, Education and Welfare for the training of professional persons to work with the disabled. This grant provides for the appointment of additional faculty members in the field of rehabilitation and the award of traineeships for a selected number of persons admitted to training.

The training programs being established or extended by the grant will include medicine, nursing, social work, physical therapy, and vocational counseling.

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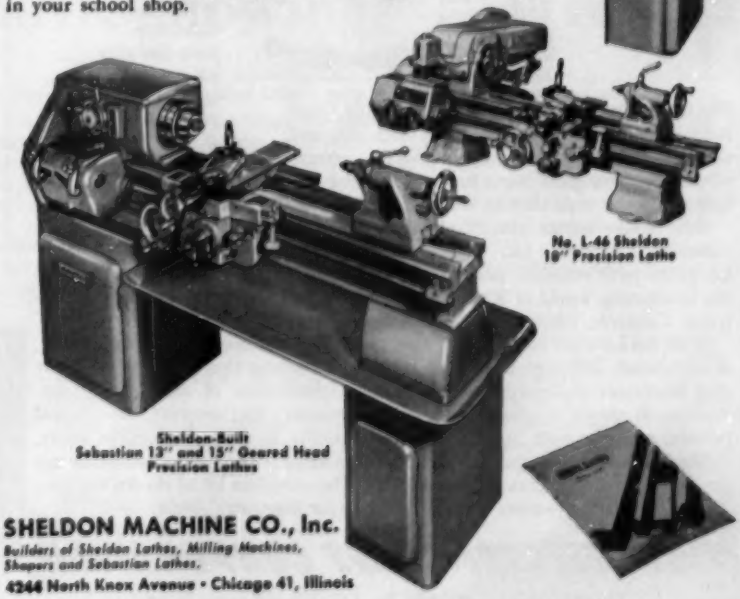

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New Publications

Vocational Education and Practical Arts in the Community School

By Harold M. Byram and Ralph C. Wenrich. Cloth, 512 pp., 5½ by 8½ in., $5.50. The Macmillan Co., New York City.

A comprehensive and thorough discussion which will be found very helpful by local administrators, members of boards of education, teachers, and members of communities.

It describes the modern community school, the human and other resources of the school and community, vocational education and practical arts in the community schools, vocational education and society's need for such education, and the nature and contribution of the practical arts.

The book also describes practical arts programs for the elementary and secondary schools, as well as the place of vocational education in secondary and adult education programs.

In the part of the book discussing "Organization and Administration," there are directions for determining the needs of the community; how to get evaluation by citizens' committees; how to set up policies for the school personnel; and how to finance and interpret the program.

Fundamentals of Carpentry — Volumes I and II

By Walter E. Durbahn, Volume I, cloth, 374 pp., 5¼ by 8½ in., illus., $3.95; Volume II, cloth, 512 pp., 5¾ by 8½ in., illus., $4.95. American Technical Society, Chicago, Ill.

This is the second edition of these two books that have made a real place for themselves in the field of vocational education.

Written by a man who has had years of experience as a skilled tradesman, an excellent teacher for thirty years, and a man who has entertained and taught thousands with his TV program, these two volumes will be found helpful to students, apprentices, home crafters, and do-it-yourself enthusiasts.

Volume I treats of tools, materials, and practices.

Volume II treats of practical construction as applied to modern house construction, or the remodeling of existing structures.

Synchros, Self-Synchronous Devices, and Electrical Servo-Mechanisms

By Leonard R. Crow. Cloth, 222 pp., 5½ by 8¼ in., illus. The Scientific Book Publishing Co., Vincennes, Ind.

This book was written to give readers an understanding of the basic principles underlying the operating theory, and the use and application of synchros and self-synchronous electrical mechanisms.

Its chapters present the general information about synchros, single-phase synchronous drive devices, synchro control transformers, differential synchros, experiments with synchros, positional errors, two-speed synchro drives, applications of self-synchronous devices, d.c. self-synchronous devices, phase rotation indicator, power synchro and the synchro tie, magnesyns and saturable-core devices.

The Ship: How She Works

By Stuart E. Beck. Cloth, 71 pp., $2.75. John deGraff, Inc., New York 10, N. Y.

This book explains in detail, in relatively untechnical language, how modern steam and motor ships are operated. Part I describes the instruments found on the bridge and used for controlling the ship; Part II describes the machinery and devices located in the boiler and engine rooms to propel the ship; Part III takes up the deck equipment, particularly the derricks, winches, and anchors; Part IV describes the modern means of air and temperature control of ships; Part V describes the special construction of the hull and of the several devices for making the ship safe against disaster. A brief glossary concludes the work.

While the book will be of primary interest to schools where young men are prepared for the merchant marine, the book will also be found of special interest in school libraries where children are studying that modern miracle of transportation, the modern merchant ship.

Aircraft Today

By John W. R. Taylor. Cloth, 96 pp., 7½ by 9¾ in., illus., $4.75. Philosophical Library, New York, N. Y.

A book which reports annually on the developments made in the different types of commercial bombers, fighters, and jet aircraft.

Eleven engineers and writers experienced in the field of aeronautics have contributed to this year's edition. These different articles are not only highly interesting but very educational.

The titles of these articles are: Review of World Aviation; Build Yourself an Aeroplane; What Do We Know About Russian Aircraft?; Camera in the Clouds; The New London Airport; Swan-Song of the Flying Boat?; R.A.F. Squadron Insignia; The Air France Story; How Near Is Push Button Warfare?; Collectors' Corner; Shortening the Take-Off; The Future of Military Air Transport; New Look in Models; The Adventure of Test Flying.

(Continued on page 28A)

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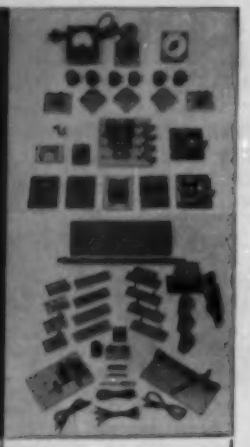

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The Crow Electri-Kit for Beginners and the Crow Basic Electronics Kit have brought electricity and electronics into thousands of schools . . . schools where these subjects were long considered too difficult or too expensive to teach.

Now Crow brings you Model 53—a unique *Advanced Electronics* kit. This "learn-by-doing" kit gives your students penetrating insight into the fascinating world of Radio Transmitting and Receiving, Industrial Electronic Controls, Electron Tube Theory, and Basic Radar and TV.

With the kit's 108 components, students *build their own operating assemblies.* A correlated, 400-page work manual gives complete directions for assembly plus historical background and practical applications of each experiment. Written in simple language using only elementary mathematics, the manual permits teachers with limited technical training to teach the course easily.

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Packaged and portable—Easily moved from classroom to classroom or auditorium. Students can manage it.

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Smooth, easy start for more effective movie showings

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NEW PUBLICATIONS

(Continued from page 26A)

Rural Electrification

By J. P. Schaenzer. Cloth, 378 pp., 6⅛ by 9¼ in., illus., $3.75. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

This text, written by a man who has years of practical and teaching experience in the electrical field, has been thoroughly tested in the field and in the classroom, and has now been fully revised.

The use of electricity on the farm, in the home, and in the barns has been exhaustively treated.

The book is divided into 30 chapters which clearly explain and illustrate how electricity is made and distributed; what materials are used for wiring; how it serves the farmer; and how the farmstead, home, barns, and outbuildings may be wired.

It also gives information about lights and lighting, electric motors; fractional h.p.-motor appliances; and the application of motors to the many power needs on the farm.

The use of electricity for refrigeration, freezers, laundry, cleaning, and kitchen and household equipment are fully discussed.

The Preservation of Natural History Specimens — Volume I — Invertebrates

Edited by Reginald Wagstaff and J. Havelock Fidler. Cloth, 205 pp., 7½ by 10 in., illus., $10. Philosophical Library, New York, N. Y.

A helpful book explaining the techniques used in the preservation of natural history specimens. The step-by-step method employed in the text will be found useful by both professional and amateur naturalists.

Modern practices of arrangement and maintenances of collections and of the materials and apparatus used in work of this kind also are explained.

Management for Better Living

By Mary Catherine Starr. Cloth, 451 pp., 6⅞ by 9¼ in., illus., $3.80. D. C. Heath & Co., Boston, Mass.

An excellent book interestingly written and illustrated. It is a text for students of secondary school age, but it also will be found useful by housekeepers who have had years of experience.

It should be studied by both boys and girls, and adherence to some or all of the suggestions contained in the book will do much to make life happier to all.

The three parts into which the book is divided present the place management has in personal and family living — in budgeting one's time and energy, and in managing money and income.

Crop Protection

By G. J. Rose. Cloth, 223 pp., 5¾ by 8¾ in., illus., $10. Philosophical Library, New York, N. Y.

This is a book which aims to help the farmer to protect his crops from the time the seeding or planting is done until they are ready for marketing.

Section I treats of cultural control, formulation, and choice of formulation.

Section II treats of chemical weed killers, insecticides, fungicides, and rodenticides.

Section III describes application machinery, dusting systems, spraying systems, etc., and also the operating and maintaining of the application equipment.

Section IV discusses how stored products are to be protected.

The book also contains a number of useful tables. It is well illustrated and presents a number of colored plates.

Fish Saving

By C. L. Cutting. Cloth, xv–371 pp., $12. Philosophical Library, New York, N. Y.

This history of fish processing from ancient times to the present is written from the English standpoint, but the author has devoted sufficient attention to Canadian and United States conditions to make the work valuable to North American readers. The catching of fish for food purposes can be traced to the earliest records of civilized man. Comparatively few changes have occurred in all the long centuries from the earliest processes of salting, drying, and smoking fish. The extensive use of icing on fishing vessels introduced in the middle nineteenth century broadened the fishing areas from which the catch might be taken, and together with the rapid movement of steam propelled ships made almost every area of the extreme northern and southern oceans profitable areas for the European fishermen. The real progress in modern times dates back to the late 1880's when scientific research determined that the air itself, as well as micro-organisms, contributes to spoil fish for food and industrial purposes. This same research has shown the need of applying the preservative treatment immediately after the catches are made. This is particularly true of freezing at extremely low temperatures which permits the distant shipping and storage of fish for later smoking or canning.

Teachers of home economics may find the chapters on the marketing procedures and the preparation of fish meal, oil, and fertilizers, a bit outside their interests. As a whole, the book will be found informative and distinctly helpful for collateral reading.

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The Brand New, Grand New B-G Portable Elementary Work Bench
IDEAL WORKING AREA for four or more students. Can be moved from room to room on its locking casters. Two built-in tool panels, two sloping panels, 22" x 23" each, facing on either side, and two end panels 19" x 23", give you plenty of well organized tool storage area which is visible at all times. This coupled with the double door storage space (21" width, x 20" height, x 18" depth) can be used for projects and consumable items. Constructed of hard maple, finished in natural —overall size: top — 60" x 28" x 1¾"; height, 28¾". Complete with kit of assorted tool holders.
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New! Student Craftsmen's Fairs

This year, Ford is encouraging and assisting in the sponsorship of Student Craftsmen's Fairs all over the country. These Fairs will serve as local "showcases" for IAA entries, and as recognition-getters for participating students and teachers. Already, Fairs are scheduled for Philadelphia, Long Beach, Greensboro, Miami, and London, Ontario. There'll be others, too. If no Fair is planned for your area, we'd be pleased to help you get one started. Free promotional assistance is yours by writing us at the address below.

Fairs must be over in time to ship entries to Salt Lake City or Dearborn *for the national IAA competition.*

Projects must be RECEIVED by these days:

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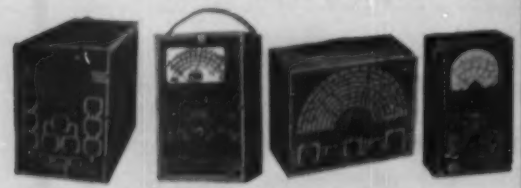

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SOLDER

Business and Personal News

MOVING DAY

Monday, January 23 was "moving day" for the McKnight & McKnight Publishing Company of Bloomington, Ill. During that week the company occupied its just-completed plant and offices on a beautiful site at the east edge of the city of Bloomington, Ill.

William W. McKnight, Sr.

Founded in 1895, the company has just completed its sixtieth year of service to education. William W. McKnight, Sr., founder and president of the Company, has long been anxious to see the business in a building designed and built expressly for its operation. The new building is the realization of a dream that he has had for many years.

Located on a 13-acre tract, with plant and warehouse space of 12,800 square feet and offices of 5000 sq. ft., the modern one-story structure gives the company unusual facilities for its operation, with additional site space for expansion.

McKnight & McKnight are well known to school people for their publications in industrial education, guidance, and home economics.

W. F. ROCKWELL AWARDED ADVANCED DEGREE

W. F. Rockwell Jr., president of Rockwell Manufacturing Company, recently received a technical degree of Industrial Engineer at the Centennial Commencement Exercises at Pennsylvania State University.

Mr. Rockwell received his degree for a paper on "The Definition and Assignment of Executive Responsibility in the Management of a Corporation."

The technical degree is awarded to graduates of the University's engineering school on the basis of a special thesis in the field of engineering in which the graduate has previously received his B.S. degree and after professional experience in this field.

GRAMERCY GUILD GROUP, INC.

A merger and consolidation of the Gramercy Import Company with its manufacturing interests in Germany, into the Gramercy Guild Group, Inc., has been announced by Frank Oppenheimer, president of Gramercy Import Company, with its New York headquarters still at 120 Broad St., New York 4, N. Y.

(Continued on page 33A)

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July 16-August 10. Curriculum Workshop in Industrial Arts.

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FIRST TERM JUNE 11-JULY 14
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For Bulletin write Dean of Summer Session, 613 Johnston Hall

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For catalogs and detailed information write to

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Section C • Corvallis Oregon
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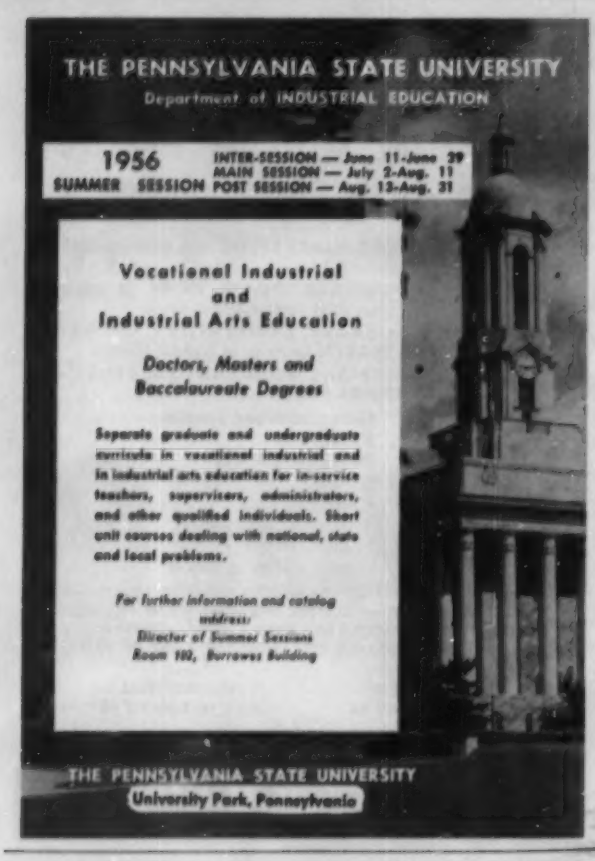
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NEW YORK UNIVERSITY

Washington Square New York 3, N. Y.

BUSINESS AND PERSONAL NEWS

(Continued from page 30A)

This represents a major step forward for the Gramercy Import Company, which was founded in 1947 by Mr. Oppenheimer, for the purpose of importing drawing instruments, such as the Riefler instruments.

Henceforth, the firm will be known as Gramercy Guild Group, Inc., and all business will be conducted under this name.

AMERICAN CRAYON COMPANY ORGANIZATIONAL CHANGES

Paul F. Heile has been appointed sales manager of the American Crayon Company on July 1, 1955. Mr. Heile joined the company in January, 1936, as educational salesman in Pennsylvania and West Virginia, then held the position of district educational manager until 1952, when he was appointed assistant sales manager — East.

At the same time Bernard Moffet was appointed assistant sales manager. Mr. Moffet started in January, 1935, as sales representative in the Midwest, then later was district manager and then assistant sales manager — West, since 1952.

Gordon E. James retired as sales manager for health reasons and will continue on a part-time basis after 35 years of active service. Mr. James joined the company in 1920 as salesman covering Central Western States, progressing to director, General Sales Division, prior to general sales manager appointment in 1952.

Descriptive Material

CLAMPS, KINDS, USES, AND HISTORY

The Cincinnati Tool Company announces their Catalog No. 65 which pictures and describes their automatic testing machine, small *C* clamps, junior clamps, super-junior clamps, standard carriage clamps, forged steel super-clamps, deep general purpose clamp, deep clamps *C* clamp style, welders clamps, improved *I* bar clamps, improved spring clamps, clamp fixtures, steel spindle, miter frame clamp, cold chisels, rivet busters, wood wrecking and floor chisels, tile and brick chisels, solid and pin punches, center punches, bull points and star drills, dust ejector drills, carbide tipped drills, file cleaners, washer and metal cutters, and suggestions for care and use of clamps.

The firm has also published a 5½ by 8½-in. history of clamps.

(For Convenience Circle Index Code 0413)

NIAGARA'S NEW BULLETIN ON SHEET-METAL TOOLS

Nine new hand tools, for the sheet metal-worker, are introduced in Niagara's New Bulletin 78. They are three new compound leverage shears (for straight, right, and left cuts), three new straight snips and three new combination snips.

Also described and illustrated are Niagara bench shears, hammers, mallets, stakes, bench plates, rivet sets, groovers, hollow punches, bending machine, roofing folder, pipe crimper, roofing double seamer, and gutter beader.

Requests for Bulletin 78 should be addressed to Niagara Machine & Tool Works.

(For Convenience Circle Index Code 0414)

IDLER FOR BACKSTAND

Behr-Manning have published complete plans for making a useful backstand for doing power sanding jobs on wood or metal parts. Besides giving the one who makes it an excellent sander, teachers and students will find the idler backstand an excellent job for the drafting room and machine shop.

They have also published a pamphlet on finishing. It contains 32 pages, and retails at 25 cents. It is written in simple language and contains many fine illustrations.

Another pamphlet, written for home craftsers, farmers, and mechanics, describes how to sharpen tools.

(For Convenience Circle Index Code 0415)

NEW JAM HANDY CATALOG

New instructional materials to help teachers have just been added in a new catalog issued by The Jam Handy Organization. The catalog describes 400 class-tested filmstrips in both color and black and white. New kits for 1956 release are described.

The materials, including recordings which are provided with some of the filmstrips, are listed by subject area, for easy reference. Curriculum areas include Reading Readiness, Primary Literature, Music, Health, Science, Social Studies, Nature Study, History, Geography, Arithmetic, Physics, Mathematics, Shop Training, and Safety.

Many illustrations from key frames of the new filmstrips are shown. Prices are listed.

The new catalog is available now from The Jam Handy Organization.

(For Convenience Circle Index Code 0416)

YOU CAN PATCH IT with CASTOGLAS

From left to right: Leakproofing boat hull with Castoglas impregnated fiberglas fabric. Patching gutter and gooseneck with glass tape. Glass putty made of resin and ground glass fiber is harder and tougher than any concrete.

CASTOGLAS RESINS COMBINED with ground glass fiber and fiberglass fabrics are responsible for major improvements in the industrial maintenance field. Repairs that heretofore would have been either impossible or entirely impractical with conventional materials can now be handled successfully even by an unskilled worker.

With the contents of this $5.00 Fix-It-Kit you can make dozens of repairs.

Castoglas and fiberglass have unusually good weathering properties and are resistant to rust, corrosion and temperature extremes. They are unaffected by gasoline, oil, fumes and most acids. Major emergency repairs can be completed in a matter of minutes without expensive plant shut-downs.

Plastics Save Time and Money

Important as these newly developed chemicals are in industry, they are no less essential in the school shop, for the home owner and farmer. Consider these economies: It cost 5¢ and a few minutes to repair the gutter; 8¢ for the gooseneck; 9¢ for the floor crack; 2¢ for the bird bath. Everyone of these repairs has lasted for 3 years and are as good as ever.

Springtime Is Fix-It-Time

Why don't you requisition one of these kits right now? Or, if you want to use it yourself, save the postage and send $5.00 with the order. Want more facts first? Send for these two *Castoliters*, they are free to teachers: "How to Make Old Boats New With Fiberglass" and "How to Patch With Fiberglass and Castoglas." Write to:

School Department D-50

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Shop Equipment News

IMPROVED DELTA BELT GRINDERS

Four improved models of the Delta 2½-in. belt grinder featuring new rubber contact wheels and improved belt alignment adjustment have been introduced by Rockwell Manufacturing Company's Delta Power Tool Division.

The new contact wheels assist in obtaining a better finish in less time, and they increase the life of abrasive belts. The hubs are designed to accommodate standard tires 2½ in. wide and 6 in. in diameter so that tires may be easily replaced from most industrial distributors' stocks.

Delta Belt Grinders

For easier and more accurate belt alignment, the standard back stand idler units in the new models are designed to make possible lateral adjustment of the drum. They also still have the hand knob control for belt tracking adjustment.

(For Convenience Circle Index Code 0401)

NEW BLACK & DECKER VALVE REFACER

A new Deluxe Super-Service No. 626 Valve Refacer with an air chuck that grips the valve stem in the workhead instantly has been announced by The Black & Decker Mfg. Co. With the air chuck feature the Valve Refacer becomes a high-production tool. Precision-built, yet simple to operate and adjust, it includes all the equipment required to perform a precision valve refacing job.

The machine handles all valve heads up to a 4-in. capacity and valve stems from $\frac{9}{32}$ to $1\frac{1}{16}$ in. A special collet is available having a valve stem range from $\frac{7}{32}$ to $\frac{15}{32}$ in. Valve faces can be traverse ground at any angle from 0 to 90 deg. All popular valve face angles are calibrated on the worktable, and the proper angle can be set by adjusting the workhead.

Two specially designed Black & Decker universal motors independently drive the collet and wheel spindles. To eliminate all vibration, the wheel motor is mounted on rubber bushings. The workhead spindle is belt-driven with reduction gearing at the motor to eliminate any chance of *chatter* on the valve face.

For smooth, wet-grinding accuracy at a low temperature, a new improved type of coolant system is featured. The coolant pump is mounted on the wheel head motor with one valve directing the special coolant to either wheel. Splash on the operator has been eliminated.

New Black & Decker No. 626 Valve Refacer

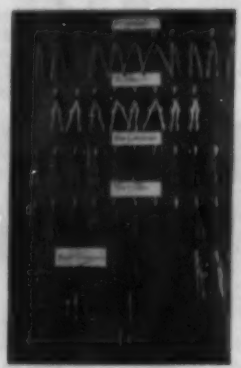
All improvements noted in the foregoing, except the air chuck are included in the Black & Decker new improved No. 550 type TD Valve Refacer. The air chuck can be purchased as an accessory for the types T and TD Valve Refacers when high production is desired. On special order Black & Decker can furnish an air chuck adapted to all their previous models of Valve Refacers.

Standard equipment on both Nos. 626 and 550 Black & Decker Valve Refacers includes a wheel dresser with diamond, two valve stem collets, a leatherette cover, a 5-in. grinding wheel, coolant, and a complete valve stem, tappet and rocker arm grinding attachment with a 4-in. grinding wheel. In addition the No. 626 includes the air chuck, a hand-tightening chuck, and a can of grinding oil.

(For Convenience Circle Index Code 0402)

A GOOD INSTRUMENT CABINET

With the co-operation of the industrial-arts department of Amherst Central High School, Snyder, N. Y., the mechanical drawing department has installed a large cabinet especially designed for hanging drafting tools.



Masonite Peg-Board Panel in the Drafting Room

The wall-hung cabinet is 6 by 3 ft. by 3¼ in. deep. It has three sliding panels of Masonite Tempered Presdwood. The tools are suspended on metal hooks placed in the cabinet back, a Masonite *Peg-Board* panel.

Instructor Robert L. Schonewolf reports the hooks-and-holes make it easy to arrange the tools for easy selection by students.

(For Convenience Circle Index Code 0403)

MAKING MEETING ROOM EQUIPMENT

A new 12-page instruction booklet entitled "Meeting Room Equipment Ideas," has just been published by Reynolds Metals Company showing how to make 10 items of meeting room equipment, including a lectern, flannel board, carrying case, easel, stool, projection stand, and speaker's timer.

Lightweight Meeting Room Aids

These items have created tremendous interest. They are largely the brain children of Cloyd S. Steinmetz, Reynolds own director of sales training, who has found them useful in fulfilling his own speaking engagements.

(For Convenience Circle Index Code 0404)

FOAMGLAS THIN WALL AND SANDWICH PANELS

The Pittsburgh Corning Corporation has published a 12-page brochure, "Foamglas in Thin Wall and Sandwich Panel Construction," which describes and illustrates how these panels are utilized in various types of projects.

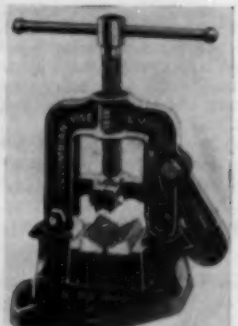
The brochure is available, on request, from the Pittsburgh Corning Corporation.

(For Convenience Circle Index Code 0405)

LONG JAW, HINGED PIPE VISE

The improved "Long Jaw" Hinged Pipe Vise that is reputed to combine superior holding power with increased life, has been announced by The Columbian Vise and Mfg. Co.

Among its outstanding features are reversible lower jaws. These are milled on both sides to provide double life and securely fastened from the top. They can be easily reversed or replaced without removing the vise from the bench.



Columbian "Long Jaw" Hinged Pipe Vise with Reversible Lower Jaws

All cast parts are made from malleable iron to provide strength and durability. The self-locking hook is easy working and unbreakable. Screw and handle are made of cold-rolled steel

(Continued on page 36A)

Just off the press

Catalog of WOODWORKING & METALWORKING MACHINERY, TOOLS AND EQUIPMENT

The new 1956 Patterson Brothers catalog, listing all the latest in: Metals, Benches, Electrical supplies, Finishing materials, Hand tools, Hardware, Machine tools, Metalworking tools, Portable Electric tools, Precision tools, Sheet metal equipment, Welding Equipment. Contains up-to-the-minute information on equipment needed for the complete school shop.

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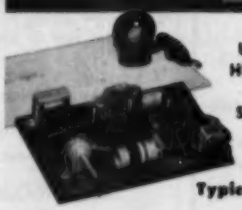

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   Gives complete coverage of fundamentals plus a detailed, specific, and integrated exposition of the operation and setup of all machine tools. $5.50
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SHOP EQUIPMENT NEWS

(Continued from page 34A)

with the ball ends forged from handle stock.

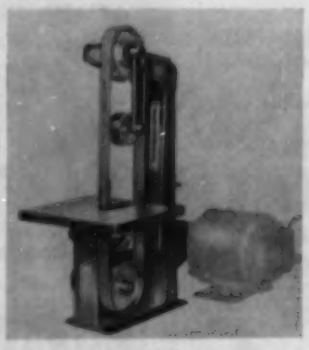
Long-bearing, heat-treated tool steel jaws are designed to prevent crushing or scoring the finish on pipe, conduit, thin wall tubing, etc. The vise is also equipped with a handy bender for small pipe.

Columbian *Long Jaw* Hinged Pipe Vises are available in 4 models, designated as Nos. 160–161–162–163. Their pipe capacity ranges from ⅛ to 2 in. to ⅛ to 4½ in.

(For Convenience Circle Index Code 0406)

NEW MODEL BANDSANDER

A streamlined and modernized version of the popular sanding, de-burring, and grinding machine is announced by Mead Specialties Company. The frame members are steel stampings instead of rough iron castings, and have a lustrous hammered satin finish in vista green. The original features of this time-tested machine have been retained and improved — quick change of abrasive belts, tilting table top, automatic self-alignment of pulleys, automatic spring belt tension, and the exclusive ability to pass the belt through cutout openings to sand inner edges. The new model uses either 1 by 42 or 1 by 44-in. belts for both inside and outside grinding, making it unnecessary to stock both sizes. It is equally good for roughing out coarse cuts or putting final finish on metal, plastic, or wood — depending only on selection of the proper grit and the instantaneous change of belts. Some large plants use literally hundreds of these adaptable little machines, spotted around the shop at strategic points to fill in *waiting time* on other machines; and there is no setup time. For further information, write to Mead Specialties Co., for a copy of their free Industrial Bandsander Bulletin.



New Model Bandsander

(For Convenience Circle Index Code 0407)

PROTO ACQUIRES TAC RATCHET WRENCH LINE

M. B. Pendleton, president of the Plomb Tool Company, has announced the acquisition of certain assets of the Tubing Appliance Company, Inc., including essential machinery, tooling, patents and inventories of TAC ratchet wrenches. All physical assets involved have been moved to the PROTO plant of the company in Los Angeles, where manufacture of the wrenches as PROTO-TAC tools has already been started.

Addition of the TAC line expands the PROTO coverage of hand tools for all types of industry by some 200 items. These patented tools perform many jobs that cannot be han-

(Continued on page 38A)

QUICK CLAMPS SAVE TIME
Individually Power-Tested for Better Performance

9 STYLES 48 SIZES
FOR EVERY USE
FASTER • RIGID • POSITIVE

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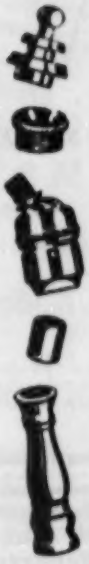

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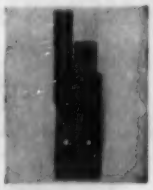

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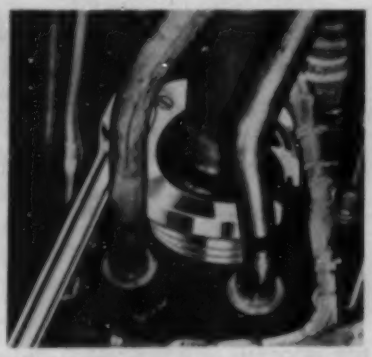
SHOP EQUIPMENT NEWS

(Continued from page 36A)



Proto-Tac Open Socket Ratchet Wrench used on hard-to-reach tubing nut

dled efficiently with conventional tools and therefore fill a big need among industry and government tool users.

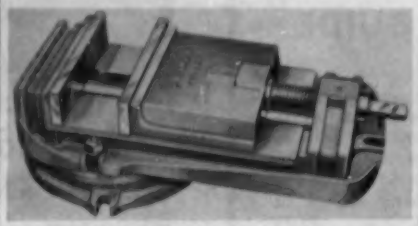
PROTO-TAC ratchet wrenches are made in four basic types — open socket, closed socket, crowfoot, and *Hy-Tork* box. The complete line includes sets, ratchet heads, rigid heads, handles, sockets, universal joints, screwdriver attachments, and adapters for standard sockets, turnbuckles, and internal wrenching.

Using the open end ratcheting principle, PROTO-TAC tools work in close quarters, over and around tubing and other obstructions, on hidden bolts and nuts, and in deep recesses or wells. They are made from tough special steels.

(For Convenience Circle Index Code 0408)

MOGUL MILLING MACHINE VISE

A new super-strong flange construction milling machine vise, known as the Mogul, has just been introduced by L-W Chuck Company.



Mogul Milling Machine Vise

The 5/8-in. thick steel jaws measure 8 5/8 in. wide and 2 3/16 in. deep and open 6 in. when in place. There is full length bearing on the ground bar and machined ways.

All surfaces are ground for extreme accuracy and the work holding surfaces are always held at true right angles or parallel to the table. There is a large Acme steel screw with replaceable bronze nut.

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line of smaller milling machine vises. Free literature and price list on these and the new Mogul vise will be sent to anyone requesting it.

(For Convenience Circle Index Code 0409)

R. E. PETERSON COMPANY JOINTER HOLD-DOWN

The Repco Safety Hold-Down manufactured by the R. E. Peterson Company, is a safety device which should be in every shop where a jointer is used, whether that is in the home shop, the school shop, or the industrial woodworking shop.

The Repco Jointer Safety Hold-Down Device

It is a device which places a constant pressure on the board just before, during, and after it is engaged by the cutters. Even short pieces can be handled safely, and it eliminates all chatter, kickback, and back lash. It does away with the use of pushers, because after the board has been pushed through a safe distance beyond the front blade, it may be pulled through the rest of the way.

The cutterhead is thoroughly guarded so that the operator's fingers cannot come near the cutting blades.

(For Convenience Circle Index Code 0410)

CAPACITOR CHECKER KIT

Allied Radio Corporation, distributor of Knight-Kits, announces the release of a new capacitor checker that tests capacitors for opens or shorts while the capacitors are still wired in the circuit. This time-saving feature is a real boon to the serviceman, since there is no need to unwire connections. The instrument is in kit form to provide substantial savings.

Capacitor Checker Kit

The checker uses a *magic-eye* to give an immediate indication of opens or shorts in practically any bypass, blocking, coupling, or filter capacitor. The test for opens can be made on any capacitor of 20 mmf. or greater

(Continued on next page)

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SHOP EQUIPMENT NEWS

(Continued from previous page)

capacity, even if the capacitor is in parallel with a resistance as low as 50 ohms. The test for shorts can be made on any capacitor up to 2000 mfd., even when shunted by as low as 20 ohms.

The ability to detect open capacitors without unwiring them from the circuit is achieved by using a 20-mc Hartley oscillator, coupled to a quarter-wave line. The checker also has an a.c. test voltage, to permit checking for shorted capacitors while the capacitors are still in the circuit.

The kit is listed in the Allied Radio Corporation's catalog as No. 83F119.

(For Convenience Circle Index Code 0411)

NEW FOOLPROOF POWER SAW

The Brett-Guard Company is producing a new safety guard that affords complete protection in the operation of any conventional table saw with blades of 6 to 16 inches in diameter.

Inventor Frank Bretthauer demonstrates the use of the guard

It is made of cast aluminum, and a transparent shield of shatter-resistant ⅛-inch thick Plexiglas which covers the saw allowing full vision and complete accuracy in a wide variety of operations, such as mitering, cross cutting, compound mitering, ripping, rabbeting, tenoning, dadoing, feathering, diagonal sawing, template cutting, drop sawing, plowing and tonguing.

The guard is so designed that it is capable of providing horizontal and vertical pressure, and that it can be used as an overriding fence for angular work.

(For Convenience Circle Index Code 0412)

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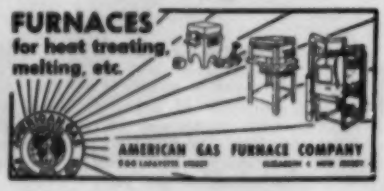

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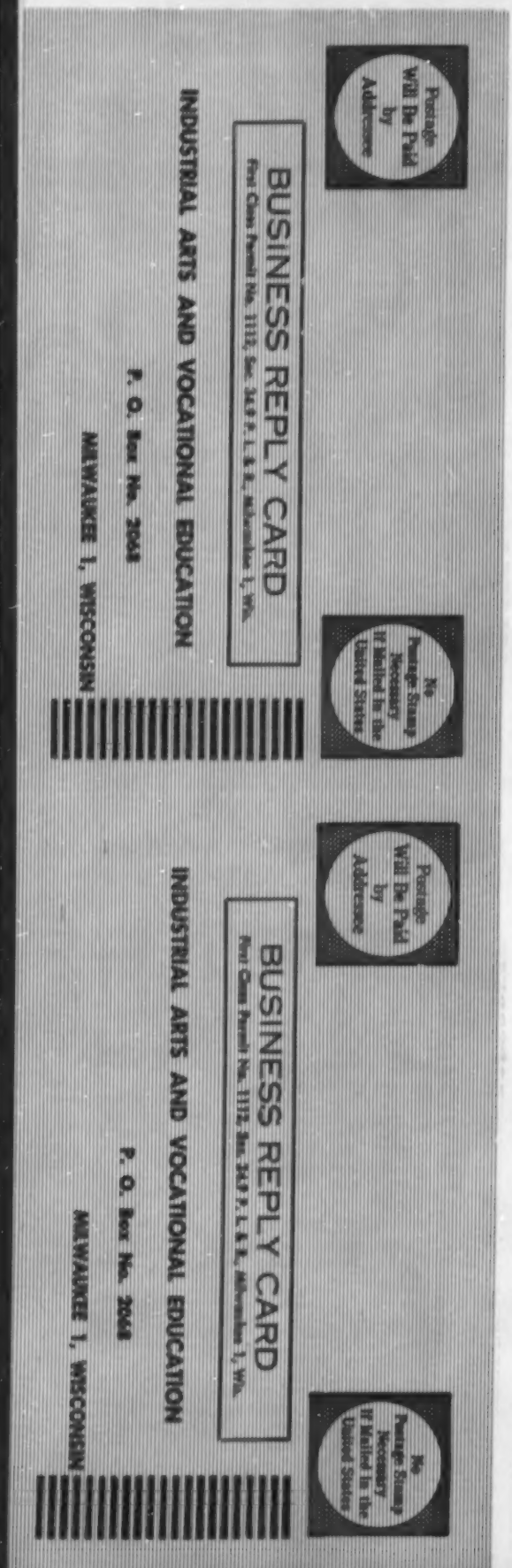
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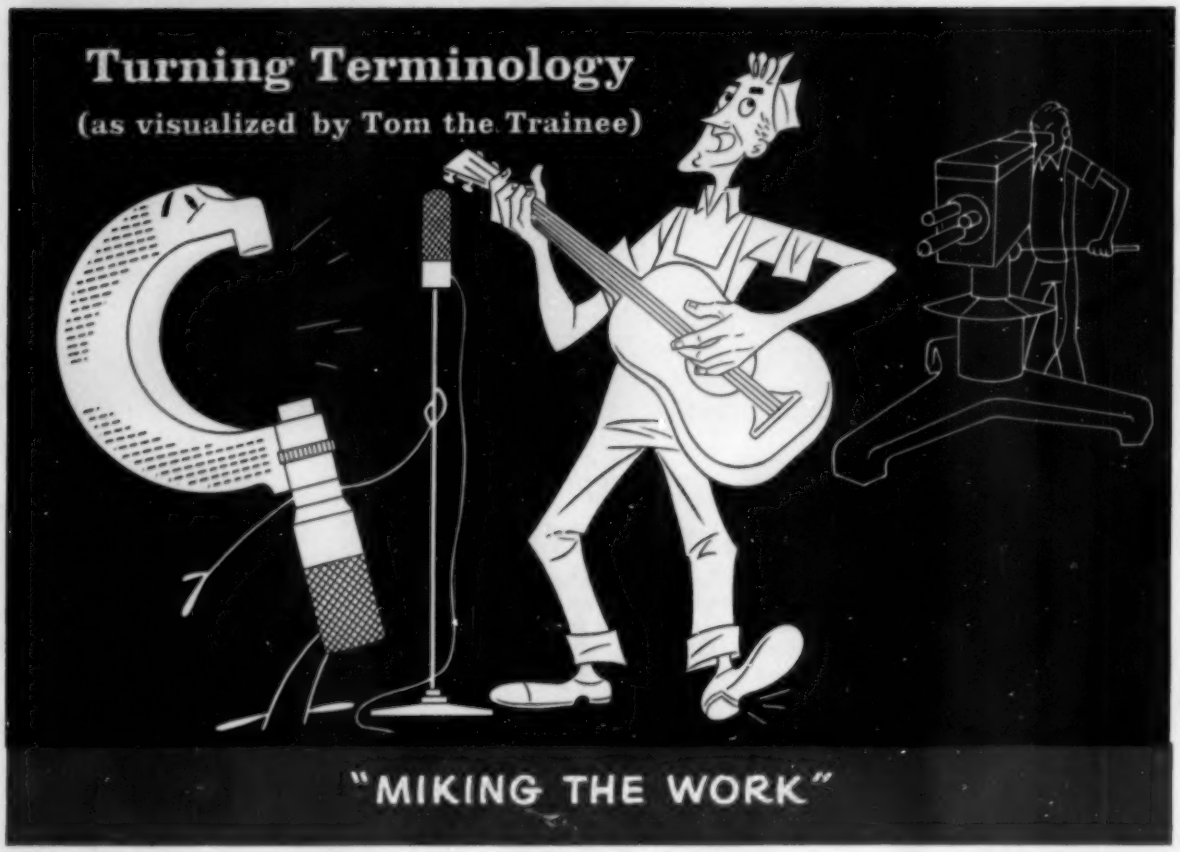

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